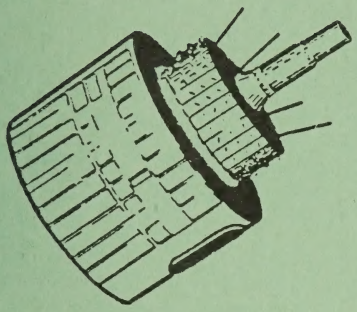
NEWSLETTER No. 19



REMOTE IMAGING GROUP

DECEMBER 1989

REMOTE IMAGING GROUP (R. I. G.)
NEWSLETTER No. 19 DEC 1989

EDITOR & SECRETARY
Phil Seaford, G8XTW
14 Nevis Close, Leighton Buzzard, BEDS LU7 7XD
Tel: 0525 384419 7.30 pm to 9.30 pm Please

CHAIRMAN
Henry Neale, G3REH
Thornlea, Fishersgate, Sutton St. James,
Spalding, LINCS. PE12 0EZ
Tel: 0945 85353

MEMBERSHIP SECRETARY
All membership enqs/subs/applications
Des Watson, G3YXO,
Norton, Gote Lane, Ringmer, Near Lewes,
East Sussex. BN8 5HX.

TREASURER
Bob Leggett, G6KMM
Correspondence to Editors location for time being

RUSSIAN SATELLITE INFO. COORDINATION
Les Currington, G8LOK
14 Homerfield, Welwyn Garden City,
HERTS. AL8 6QZ
Tel: 0707 326058

EDUCATION & SCHOOL LIAISON
Colin Hall
120 Salisbury Road, Mosley, Birmingham B13 8JZ
Tel: 021 449 0006

EXHIBITIONS & RALLY CO-ORDINATOR
Mike Coombs, G4YBB
Tel: 0530 243494

COMMITTEE: Stan Ames, Dick Boardman, Gordon Fleming,
Peter Newman, Ian Gurton, Dermot Dobson

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CONTENTS

COMMITTEE		INSIDE FRONT COVER
EDITORIAL		2
CHAIRMANS WAFFLE		3
ARMCHAIR VIEWING	Andrew Bell	7
APT ON THE PC,THE STORY CONTINUES	Roger Barker	16
HRPT - THE SAGA CONTINUES	Peter Hayes	19
TAMING THE LOK IMAGE SELECTOR	Ken Willis	22
STARTING OUT	David Woods	26
RUSSIAN SATELLITE SCENE	Les Currington	30
CURRENT KEPLER DATA	Max White	31
RUSSIAN REFERENCE ORBITS	Dick Boardman	32
CENTREFOLD:		
NOAA 11 and METEOR 3-02	Marciano Righini,	
NOAA PREDICTIONS	Bob Leggett	
****** SUBSCRIPTION FORM FOR 1990 *******		
YU3 FRAMESTORE, 20 lpm MOD.	Graham Moss	33
HOMEMADE DISH	British School, Holland	35
MAPLIN RECEIVER MODS	Peter Hayes	40
FOR SALE:		44
MEMBERS LETTERS:		45
Prediction program	Les Hamilton	
Keplers from own Observations	Lawrence Harris	
New Met 3-03	Lawrence Harris	
Maplin Program - problem	Ron Ratcliffe	
Acknowledgements	C G Roberts	
RIG HELPLINES		53
ADVERTISMENTS		54

EDITORIAL & SECRETARIES PAGE

This issue marks the end of another successful year for RIG. Our next issue will be something of a landmark, as No 20 it will represent the end of first 5 years for the group, I wonder what technology will be around at the end of the next 5 years, on the ground by way of amateur stations and passing above providing the information? Anyway, on to the realities of today.

The LNA parts offer has been very well responded too. 60% of the batch of 50 ordered have been sold, delivery for those waiting should be before Christmas ('89!). Due to the costs involved this will not be a stock item so if you want one, order now.

Also on the aspects of RIG receiver orders and other related items are all subject to 28 days delivery, so please do not call me until after that time has expired.

For all members who do not have 'PAID 90' on their address label are now requested to renew their membership for 1990. This means the majority of members. The subs for 1990 have had to be increased to £6 to keep pace with production and postage costs. I hope that will not deter renewals and we can keep it at this level for a while.

On the subject of rallies the AGM will be held as usual at the VHF Convention at Sandown Park in May. However, more importantly, the RSGB have resurrected the rally at the NEC, this year over two days. The costs for attending I feel are exorbitant for a non-profit making group. Can members please indicate on the survey form whether or not they feel the expenditure of nearly £300 of RIG funds is money well spent to attend.

Several members may have noted long response times re correspondence to me. The real task of earning a living which involves a fair amount of international travel is getting in the way of the hobby!! Can I suggest that were possible RIG members quote telephone numbers on their letters to speed things up.

It only remains for me to hope that you and your families will enjoy the Christmas break and will see you next year.
Best Wishes
Phil

CHAIRMAN'S WAFFLE

Well Christmas is nearly here, and knowing how long it takes for us to get a Newsletter into print it's probably gone by the time you read this, and another year has arrived. What can I say that I've done in 1989? Not a lot, it's probably easier to tell you what I haven't done. Of late I have had very little time to do the things that Henry would like to do. Yes I've been in my shack, a few times, but usually to get tools or to repair someone else's gear. Still over the Christmas and New Year period I might manage to take a NOAA pass or even a Meteosat Image! It doesn't seem long since last Christmas, it must be my age showing, or just the unrelenting maturing processes which even affect Henry! I had better stop moaning or else you will be turning to the next page and find that I'm still moaning.

Last year we had a very mild Winter but Nature usually balances things up so don't be surprised if we get a humdinger this year. It's all very well for us to put an extra coat on but remember that wild animals can only stand so much harsh weather. When times are bad, just a little food and water means so much to them. It could be the difference between seeing Spring or not! Domestic animals always seem to get that bit closer to the fire on those bleak Winter evenings.

We've tried very hard to get the LNA parts to you ASAP, but even little things seem to thwart us, still we are trying hard and we should have succeeded by now.

Phil's getting the hang of the laser printer and all its peculiarities, the different fonts, styles, problems with proportional fonts, and many others. Wouldn't it be much easier if things always worked first time - boring - but easier. Still life has all the unpleasant things in it too. Henry's had his knuckles rapped by the local magistrates for not getting the old house next door demolished as agreed when planning consent was given for its replacement. Financially it was nearly three times worse than someone on an assault charge. I just cannot see the logic in it. Still those in power know best, as they say. Its just been one hard slog getting it demolished and by the time you read this it will have been completed.

After all that reminiscing, I had better look towards the future and all the new technology that is going into the newsletter production at Phil's end. I don't think we shall be in colour yet but who knows, that font he used last time rather hit you, but it was much easier to read (old age again).

Unfortunately costs just seem to escalate especially postage and have necessitated a rise in the membership fee. Mind you its a long way to the antipodes on your bike! Which reminds me of a rather painful exercise that Henry took part in last September.
Among Henry's many other non paying jobs is the position of Deanery Organiser for the Lincolnshire Old Churches Trust Bicycle Ride. It doesn't take up so much time but never-the-less has to be done by someone. This year I actually took part in the ride itself. The story is not as simple as that. I am Churchwarden at Sutton St. James, and together with Roy my fellow Churchwarden, we took part together on a tandem! Not a pretty sight! I had never been on tandem before but I did ride an ordinary bicycle back in 1959, but Roy had and this gave him he confidence to let me do the driving. The committee has threatened to include a photo taken by the press outside our Church, but only showing the local hostelry sign, of this memorable occasion. As the picture is not framestore / computer compatible we are fortunately not able to include it. If this exercise had been for just a few miles it would have been a non event, however we visited 35 Churches and rode about 63 miles on the day. Both our wives were thinking of taking out extra life assurance cover, just in case we had a heart attack or something! I wonder why? It wouldn't do us any good would it? Well I can tell you that the seat was far from comfortable and it felt like sitting on a square 2 X 2 wooden stake. I kept moving my posterior around until I had run out of vacant places and then I started the second time round which proved to be extremely painful and I only just managed to complete the course. If I could have fixed my car seat on that machine I could have gone around again, for the right money of course!

Henry's on the cadge! Not the first time I can hear you groan. This time it's nothing to do with electronics, well that is nearly true. I have a fair bit of photographic equipment. It's not used commercially but I do use it intermittently for amateur astronomy, occasional snapshots, copying etc. Any keen photographer will quickly get through his films and have quite a selection available. Well I don't get through that many, but you know what happens, when you have got slide film in the camera and you want to use high resolution black and white. So what, get another camera, but I've already have 2 bodies, well I'm on the look out for 2 more 35mm bodies. Lenses are no problem, I've already got a fair selection together with a lot of supplementary attachments. These all are based on the M42 screw thread system, except the 2nd body which is a Minolta SRT101. It is a bayonet type fitting to which I have fitted an adaptor.

If any of you have a SLR M42 type of camera body with the shutter etc working I would be most interested in obtaining 2 more. Every so often I get asked to copy very old postcards of our village and I also want a copy for myself. Sometimes FP4 is adequate but sometimes you need a film with a lot more resolution which is where PAN AHU comes in. It makes an enlargement to say 20" x 15" as grain free as a FP4 magnified to say 8" X 6" a considerable difference. It does complicate things when you only need say 8 shots on a film, hence the request for economically priced camera bodies.

On the 28th of October I had the task of lecturing to the Royal Meteorological Society. It was a daunting task but everything went well on the day. I had prepared a text to use but after mark 26 I nearly gave up, still we persevered and stuck to it reasonable well and I didn't overrun. It was very pleasant to see several RIG members in the audience.

Several of you have the task of recharging nicads from time to time. How often do you overcharge them by leaving them on charge too long? This treatment greatly reduces their lifespan! Leaving them discharged doesn't do them any good either. I use a "Henry special" circuit were possible. It is quite simple really and is based on the normal voltage regulator chips such as a 7805 etc.

These devices can be made to have an adjustable output simply by including a small trimpot in the earth connection. You can then set the output volts exactly to the voltage required (try +/- 1.4v per cell). By also including a bulb of sufficient current and voltage rating between the unregulated supply and the input to the chip you get a visible indication of how the cells are progressing. If it has gone out then the cells are fully charged (assuming the voltage has been set correctly). You can leave them charging for a month and it wont do them any harm because there is only a very small current being passed through the cells. The voltage required is easily found by trial and error by charging the cells at the I/10 rate for say 15 hours and then reducing the voltage until the bulb just goes out (measure the current through the bulb to cross check). Basically you use a current limited constant voltage output with a bulb to indicate when the set voltage has been reached. By changing the trimpot for one of those ten turn digital indicating potentiometers (for accurate setting and reset-ability) and by taking note of the various voltage output settings this circuit can then be used to charge several different types of cells.

They can be used on lead / acid cells as well (6.9v for 3 cells and 13.8 for 6 cells). The bulb needs to be about the same voltage as the cells being charged or higher and a current capacity equal to the charging current. This means that the unregulated supply has to be higher than a normal charger but by adding an additional capacitor to the unregulated supply often increases the voltage sufficiently. The adjustable regulator chips such as the 317 series are also equally usable.

Well that about wraps it up for another year. For a change Phil is chasing me to get the copy in. Don't over indulge yourselves during Christmas and the New Year because there are many in the World that need the essentials of life a lot more than you or I. Unfortunately on this planet we don't seem to have devised a system where everybody has the minimum required to maintain life. It's sad but I don't think that I can do a lot about it. At least the thought is there. I find that over the period there are a few occasions when the peacefulness and quietness refresh my inner parts and allows me to unwind so that I am more ready to start next year.

Have a pleasant, happy and peaceful Christmas and New Year

Henry

FREE DISH & FEED

Neil Martin has written in to say he is moving from his parents house to a cottage he has just purchased and there is no suitable place for the system.

He therefore offers free to any person willing to collect, a RIG dish and feed. (Note from secretary, I suggest some payment is offered)

His address is:- 19, Wellington Street, Heanor, Derbyshire, DE7 7FW. and he may be contacted by telephone:
Work - 0283 30303, Home - 0773 762635.

Armchair WX Viewing

The YU3UMV framestore and WX satellite decoder worked well within its original design aims. However, the author wanted to become an armchair image watcher and not to have to press and turn switches to switch between NOAA and MET and tweak the base setting of the ADC in search of the perfect image. The aim of the design described here was a fully automatic system which chooses intensity, scale and format according to satellite type, so that all one has to do is to sit and watch the images as the satellites pass by.

Overview

This system was designed as a one off test platform for WX satellites. Right from the start it was obvious that a soft centered system with a digital processor between the YU3UMV 001 (1) and YU3UMV 002 (2) boards was required. Alternatively the YU3UMV 002 could be dispensed with altogether if the processor contained its own video processor. Furthermore it was intended that the system should have the capability to receive high resolution pictures, when time, money and motivation permit. No constructional details are available because the processor was a wire wrapped prototype that was actually designed for a completely different task and later adapted for the reception of APT data. However, the ideas and procedures used should be valuable to anyone thinking along the same lines.

The principle underlying the new system is that no manual intervention be necessary. Some switch options however are worthwhile. The options implemented at present are:-

NOAA visible/NOAA infrared
Large/small images
Manual (no tone decoders) / automatic mode
Shift manual mode image
Freeze all processing

All these options are implemented via switches whose settings are read by the digital processor.

The Building Blocks

The original framestore (YU3UMV 002) was used to display a single image on the screen. The digital processor communicates with the framestore via the serial interface described in (3). With these two boards, any computer which has a flexible serial interface, can send pixel information to the framestore.

Having made this decision two possible facilities are almost certainly lost. Firstly the editing of on screen pixels is not possible because it takes about 20 seconds to repaint the screen. Secondly it is not really convenient to use the framestore to hold more than one image because the start points of the two image scroll together.
Neither of these facts was a problem because it was not intended to edit pixels and the plan was to have the digital processor store images if so required.

I believe that, if properly used, the 64 (6 bits worth) different levels of pixel intensity are more than adequate for most eyes.
It is the job of the digital processor to adjust pixel intensities to ensure the best contrast before sending the pixel data to framestore.

The ADC on the original board YU3UMV 001 only performs a 6 bit conversion because of the way the YU3UMV system was designed. The new design digitises to 10 bits to give a much greater range and accuracy which in turn permits the adjusting of pixel values without loss of display information.

The choice of digital processor is probably defined by what development tools can be found. It is useful to use a 16 bit processor because the ADC produces 10 bits of conversion. Also, 64 K of 8 bit bytes. This is not enough to store images unless they are somehow compacted. Finally, on the large scale settings speed is of the essence as multiply and divide operations are both used to scale pixel values. Most 8 bit processors do not contain multiply and divide instructions as hardware operations and thus will be rather slow. In conclusion a 16 bit processor is probably the best choice. I have considered using a Z8 (not Z80) processor even though this would not have enough memory to store images. The system is currently implemented on an old wire wrapped prototype card about 10 x 10 inches and various interfaces on another wire wrapped card about 4 x 7 inches.
All programming was done in assembler language to achieve maximum throughput.

Data Input

The framestore output from the RIG VHF receiver was fed into the original board YU3UMV 001 which now only performs two tasks. It provides a phase lock output of 2400 Hz and also the demodulated sub carrier.

Only 6 active ICs remain on the YU3UMV 001 now.

The demodulated sub carrier is fed into a 10 bit ADC via a sample and hold chip. I chose a 10 bit ADC (which provides 1024 different values). I was very tempted by 12 bit devices but their the price was too high. The ADC was type AD573JN and the sample and hold was type LF398. Both devices are described in RS data sheets (4) (5).

A much used feature on the original design was the ability to choose the clocking input, the options being derived from a quartz crystal divided down from a phase locked oscillator locked onto the 2400 Hz tone generated by the satellite. This facility has been enhanced to allow clocking to be derived also from a Z8000 counter on the computer board - a facility which has not yet been used! The switching between sources is achieved by setting binary bits in a parallel interface and connecting these bits into a 74LS151 data selector. The output of this then controls the start of conversion signal and the hold signal of the sample and hold.

2400 Hz Generators and LOK Filters

Due to the delay in availability of LOK boards I designed my own 2400 Hz generator and tone filter boards. Although similar my boards are not identical to the LOK design. My 2400 Hz generator board contains a voltage regulator, PCF 4060 crystal oscillator and TL072 buffer.

Both square and low pass filtered sine waves are available, although only the digital signal is now used.
The system actually contains two tone filter boards but a third could well be added one day to cater for more synchronisation tones. Each board contains two tone filters. Each filter contains a TL072 buffer and preamp with adjustable gain, a shared TL064 tone decoder to the LOK (6) design and a 74C14 Schmitt output stage. Each filter also illuminates a LED when it is active - a facility that is absolutely invaluable. For NOAA the filters are set to 832 Hz and 1040 Hz. For standard MET satellites the filter is set to 225 Hz. For the new 20 lines per minute MET the filter frequency has been set to 525 Hz.

The audio inputs of the tone filter board are all connected to the demodulated video signal from YU3UMV 001 board. The four digital outputs are sent to the digital processor, typically via a parallel interface. In my specific case these bits enter the Z8000 system bus via a tri-state buffer along side the 10 bits produced by the ADC.
In practice this is a useful trick since the information is often used at the same time.

The settings of the various controls on the mythical front panel, are input to the digital processor via a parallel interface. Under the current regime this parallel interface also requests interrupts on behalf of the ADC.

Interrupt processing

All analogue to digital conversions and associated calculations must be performed in real time, thus the ADC works under interrupt control. The interrupt routine merely takes the 10 bits from the ADC and 4 bits derived from the four tone filters and places them in a circular buffer as a 16 bit quantity. The interrupt routine also illuminates a LED while its performing, which has proved to be very useful debugging tool. No other action is taken at interrupt level.

Choosing which satellite

Normally while searching for a satellite the processor connects the output of the 2400 Hz crystal source to the clocking input.
(later on if a NOAA satellite is found the inputs will be reconnected to the phase locked 2400 Hz from the YU3UMV 001 board)

The processor now repeatedly takes conversions and watches the state of the tone filters. In order to recognise a satellite the tone filter must be active over a minimum number of ADC readings and the tone block must occur again after a set number of ADC readings. Thus the tone must occur at the start of two consecutive lines.
At this stage the scale and base values of the ADC are set to values representative of the YU3UMV design and the image displayed accordingly. As well as scaling the conversions and sending 6 bit values to YU3UMV 002 the 10 bit values are sent to a routine which builds a histogram of count values.

Only pixels which appear on the screen and away from the picture edges are considered in the histogram. In my case the pixel position must line between positions 30 and 225 on the screen.

This avoids test patterns, synchronisation tones and telemetry which cause bad scaling factors.
This histogram is used later on to calculate the base and scale to be used to display the remainder of the picture in real time.

After five lines of pixels have been sent to YU3UMV 002 the histogram is analysed and a new scale and base value are calculated to give a better quality image. It is rather pleasing to observe the improvement in image at this point. These values are used until the satellite is lost.

A satellite is declared lost when a tone has not been received for five consecutive pixel lines. At this stage the timing reverts to the crystal clock if the satellite was a NOAA and the program again compares with the table waiting for another satellite to appear.

The satellite table

The central part of the computer program is the satellite table.
This table describes the attributes of various satellites and reflects the setting of most of the front panel switches. It is worth including a copy of the table as it may help understanding of the program.

The first entry is a set of binary flags which are used primarily to skip or include entries as dictated by the front panel switches. It will be seen that by default normal size NOAA IR images are selected whilst the larger ones are skipped. By setting the 'NOAA large' front panel switch the digital processor reverses this state.

The satellite type provides a way of telling from the table entry which satellite has been selected. This is most useful for skipping various procedures when manual mode has been selected, see the penultimate entry. The MPX setting is the decimal value 74LS151 data selector in order to choose the conversion clock source. It can be seen that NOAA satellites use YU3UMV 001 (code 4) clocking whilst MET satellites use crystal control (code 6).

The third entry dictates the number of analogue to digital conversions per displayed line. For a large format image a displayed line corresponds to a satellite line but for smaller images one displayed line will encompass 2 or more satellite lines. This is because the image has to be compressed in both X and Y dimensions to maintain the true scale.

The tone bit number is the binary bit number in the parallel interface into which the output from the tone decoder has been connected. The NOAA infrared tone filter is connected to bit 15.
The 'throw way every n conversions' entry is a way of slowing up the ADC by a factor of 2.

The minimum number of tone readings to synchronise is the number of conversions over which the tone decoder must be active in order to be a valid synchronisation tone. This procedure helps reduce triggering due to interface or very distant satellites. The value chosen does depend a little on the decay time of the tone decoders and the amplitude of the AF signal fed to them. Notice that the MET tones are much longer than those from NOAA.

The horizontal picture offset provides a means of shifting the image after the end of the synchronisation tone has been noticed. This in turn enables the picture image, as opposed to telemetry etc., to occupy the maximum screen area.

Finally the satellites' Ascii name is contained in six characters. This was useful during development and when updating the tables.

NOAA Infra-red

```
dw          0               ;flags
db          0,4             ;satellite type; mpx setting
dw          2400            ;ADC's per line
dw          15              ;tone bit number (IR)
dw          2               ;throw every..
dw          15              ;min.number of tone readings to sync
dw          20              ;horizontal picture offset (pixels)
db          'NOAA ir',0,0   ;Ascii name
```

Big NOAA Infra-red

```
dw          1 .shl. skip    ;flags
db          0,4             ;satellite type; mpx setting
dw          1200            ;ADC's per line
dw          15              ;tone bit number (IR)
dw          1               ;throw every..
dw          15              ;min. number of tone readings to sync
dw          40              ;horizontal picture offset (pixels)
db          'NOAB ir',0,0   ;Ascii name
```

```
                        NOAA Visible
dw          1 .shl. skip        ;flags
db          0,4                 ;satellite type; mpx setting
dw          2400                ;ADC's per line
dw          14                  ;tone bit number (VIS)
dw          2                   ;throw every..
dw          15                  ;min. number of tone readings to sync
dw          20                  ;horizontal picture offset (pixels)
db          'NOAA vs',0,0       ;Ascii name

                        Big NOAA Visible
dw          1 .shl. skip        ;flags
db          0,4                 ;satellite type; mpx setting
dw          1200                ;ADC's per line
dw          14                  ;tone bit number (VIS)
dw          1                   ;throw every..
dw          15                  ;min. number of tone readings to sync
dw          40                  ;horizontal picture offset (pixels)
db          'NOAB vs',0,0       ;Ascii name

                        MET Images
dw          0                   ;flags
db          1,6                 ;satellite type; mpx setting
dw          2400                ;ADC's per line
dw          13                  ;tone bit number
dw          4                   ;throw every..
dw          50                  ;min. number of tone readings to sync
dw          15                  ;horizontal picture offset (pixels)
db          'MET    ',0,0       ;Ascii name

                        Big MET Images
dw          1 .shl.skip         ;flags
db          1,6                 ;satellite type; mpx setting
dw          1200                ;ADC's per line
dw          13                  ;tone bit number
dw          2                   ;throw every..
dw          50                  ;min number of tone readings to sync
dw          30                  ;horizontal picture offset (pixels)
db          'MET   B',0,0       ;Ascii name
```

20 lines/minute MET Images

```
dw      0           ;flags
db      2,6         ;satellite type; mpx setting
dw      7200        ;ADC's per line
dw      12          ;tone bit number
dw      24          ;throw every..
dw      200         ;min number of tone readings to sync
dw      40          ;horizontal picture offset (pixels)
db      '20lpm ',0,0  ;Ascii name
```

Manual Mode

```
dw      (1.shl.skip) or
        (1.shl.manual)  ;flags
db      80h,6       ;satellite type; mpx setting
dw      4800        ;ADC's per line
dw      0           ;tone bit number
dw      4           ;throw every..
dw      0           ;min. number of tone readings to sync
dw      0           ;horizontal picture offset (pixels)
db      'MAN   ',0,0  ;Ascii name
```

The system has been working consistently well for several months now and the only facility lacking is a method of storing the best images on floppy disc or similar medium. An Infrared control would be ideal. The Z8000 system does produce some RFI to the RIG receiver but if the system gets installed in a metal box this will not be problem.

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1 Vidmar, Matjaz.
A digital storage and scan converter for weather satellite images.
Part 1: Electronic Module,
VHF Communications 4/82 pp194-208

2 Vidmar, Matjaz.
A digital storage and scan converter for weather satellite images.
Part 2: Storage Module,
VHF Communications 1/83 pp12-24

3 Opperman, Hans.
PC Interface for the YU3UMV weather picture store
VHF Communications 3/87 pp 168-174

4 RS Components data sheet 6014

5 RS Components data sheet 2999

6 Currington, Les. NOAA image selector.
RIG Newsletter No. 1, June 1985 pp 14-14

Andrew Bell, GW4JJW

Centrefold Pictures:

This issues centrefold pictures come from Marciano Righini, I4MY in Italy. They represent the east most views of the Eastern Mediterranean area so far printed in the newsletter. They are of excellent quality.

The NOAA-11 image was taken on 23 July 1989 at 12:15 GMT, its an ascending pass on 137.62MHz

The Meteor 3-02 was taken on 26 July at 11:27 GMT, its an ascending pass received on 137.85MHz.

HELP NEEDED:

John Tellick, tel No. 01 390 3315, has written in asking, via the newsletter if anybody would undertake the mechanical and electronic modifications on a Muirhead K-401-D Fax machine to enable it to reproduce images from Meteosat, NOAA, and Meteor.

John lives in Surbiton Surrey and will deliver and collect, preferbly in SE England, a good price will be paid! Please call John direct.

APT on a PC - the Story Continues

Roger Barker, G4IDE

Since writing my article about computers versus the frame store for APT pictures (Newsletter No. 16), I have done a considerable amount of development on my PC system.

I took the system along to the Elvaston Castle rally, where several members saw it and it seemed to attract a lot of interest. While I was there I had some very interesting discussions about various aspects of APT picture display. At that time I was still using my YU3UMV frame store as an interface for the PC system.

Since then I have designed and built a completely independent interface for the system. It's still on a breadboard, but hopefully I will get round to drawing up a PCB for it! The interface uses a quad op-amp to filter, amplify and rectify the audio. This then feeds a sample and hold circuit built around a ZN448E and an NE567. Finally an AY-3-1015D UART transmits the eight bit data to the PC at 38.4k baud. This baud rate may seem surprising, but most PC's can handle it - even if the PC spec does say that 9.6k is the maximum! The end result is that I have 256 grey level data in the PC - I can only use 16 grey levels, but it's nice to know they're all there!

My original software used the line sync signal from the frame store. After reading Dick Boardman's article (Newsletter No. 16), I decided to try software filters for the various synchronisation tones on the new system. This has proved extremely successful. Detection of Meteosat start and stop tones and frame alignment is completely automatic within the software, and NOAA visible or IR pictures can be selected very easily at a key stroke by detecting the edge tones - much more reliably than I have ever managed with my frame store. I did not really expect it to work so well, since my sampling rate was fixed at 2400Hz, which meant that I had to do a lot of approximating.

Another major addition to the system has been a 'snap shot' mode to save screen images, plus a 'film' mode to display them. The maximum replay rate is one frame per second.

Recently I have put a lot of time and thought into getting the aspect ratio correct. The exact length of an APT line, in pixels, has been quite difficult to find in any documentation that I have been able to obtain.

The Meteosat spec seems to be 800 pixels, plus 12.4 msec for the edge - which works out to a total of about 842 pixels. Sampling at the rate of 600 pixels per line (as in the frame store) - which is very convenient - means that the picture is effectively narrowed and cannot be satisfactorily displayed on a system with a 1:1 aspect ratio, such as VGA; unless you happen to belong to the Egg-shaped Earth Society!

My original solution was to make the Earth even more egg shaped, by displaying at EGA resolution, and then compensating by either only displaying alternate lines or displaying all the lines but outputting each pixel twice. This gave very acceptable results, but I hate imperfection!

My thoughts are now directed towards getting 800 pixels per line. At the moment I am generating the data by interpolating 800 pixels from 600 samples. This has proved more successful than I expected. Early trials at VGA resolution have produced superb pictures. Standing the computer screen next to the frame store screen, the computer picture is often superior on Meteosat pictures. The comparison is quite interesting if you analyse what you are looking at. The frame store displays 256/300 of the picture width at an effective resolution of 300 pixels per line, but it has 64 grey levels. The computer displays 640/800 of the picture width at an effective resolution of 800 pixels per line, but it only has 16 grey levels. The 'missing bits' on the frame store caused by the lower resolution are quite noticeable, in particular the country outlines look very broken in comparison with the computer. On the other hand, there are noticeable 'flat' areas in the computer picture, caused by the lack of grey levels.

I have also experimented with 'super VGA' resolution - 800 x 600 pixels. This means that the full frame width of Meteosat, at full resolution can be displayed. Also with 600 lines on the screen, it means that 3/4 of a frame is viewable at one time. However, this high resolution mode does give some problems. My Tandon multi-sync monitor can display it, but the height, width and horizontal offset of the picture change drastically between text mode and 'super VGA'. In fact, with the monitor in its 'as delivered' condition I could not centre the picture, and internal adjustment was needed. The other major restriction with 'super VGA' is that none of the current compilers support it, which means that horrendous amounts of programming are needed for simple things like text output.

Where next? Well I think that interpolating 800 pixels from 600 samples will have to go! However, to get any real improvement may be very difficult. If anyone has done any experimentation with demodulators that are genuinely good enough to be sampled at frequencies other than a multiple or sub-multiple of 2400Hz then I will be very interested to hear from them. At the moment the best that I can think of is a precision full wave rectifier to give 4800 samples per second (1200 samples per line) and then to interpolate 800 pixels from this. The biggest problem with this idea is that it will push the data rate between the interface and the PC up to a very high level indeed.

Finally, one or two people have had PC APT systems from me. In my usually slovenly way I did not keep a note of names and addresses. If they would like to get in touch, then I will be happy to supply updates. Also, anyone living within striking distance of Boston with a PC-AT compatible, or fast XT compatible, with VGA, is more than welcome to bring their PC round and give the system a try. I am anxious to find out if makes of PC other than Tandon produce any unexpected problems.

FRAMESTORE WANTED

A RIG member has phoned in to ask for a small ad in the newsletter for **anybody who may have a working framestore for sale**. As I was very involved in something else at the time, I made the fatal error of not making a note of the request.

So now can I request 'that' member to call or preferably write and I will return any offers to him that I receive.

Phil, Secretary

NEWSLETTER FORMAT:

A RIG member who knows Henry has kindly provided Henry with a critique of the layout etc. He was a professional typesetter.
I have tried to take note where possible, particularly in the area of word-splits across lines. Effectively this has been turned off as I can only control the number of letters before an auto-split which can give odd results.

Phil, Editor.

AN ATTEMPT TO RECEIVE AND DISPLAY NOAA HIGH RESOLUTION PICTURES AN ONGOING SAGA.

PART 2 THE DARK BEFORE THE DAWN.....

In the last issue I described how I got the urge to receive NOAA high resolution pictures and outlined some of the difficulties involved. The satellite simulator works fine and the digital board shows every sign of doing what its told soon. The next step was to get some real live signals from the satellite. This was to prove to be not easy!

I build most of my circuits on boards similar to veroboard, but made to take DIL chips and they usually have power and ground buses already set up. However, for RF work this isn't terribly suitable, more discrete components are used and the layout can be prone to stray feedback. I found a very useful board in the local Tandy; it has one side made up with every hole having its own little ring of tinned copper, and the other side is continuous copper with clearance round each hole. This is ideal for RF work, the copper ground plane keeps stray feed back to a minimum, and with forethought most connections can be made by deliberately solder-bridging between holes. May not be very professional but provided it works I'm not worried, It's only a hobby after all!

After finding out the hard way that the pin outs given in WW for the demod chip MC1496 refer to the rare 10 pin variety and not the more usual 14 pin DIL, the circuit seemed to work as expected. So I tried hooking into the Maplin RX before the filters and again waited expectantly for a NOAA pass. I fiddled around with the Maplin local oscillator, setting it to 130.3 MHz instead of 126.8 MHz (up 3.5) thus tuning the RX 3.5 MHz higher. Switch the converter to 1694.5 MHz (Meteosat 4, channel B) and the setup is now looking at (1694.5 + 3.5) = 1698 MHz, the NOAA 10 HRPT frequency. This time however there was no great success, some vague flickering in amongst the noise on the scope even when the FT290 indicate a strong signal coming in. A sharp reminder that it's altogether a different ball-game trying to receive a signal in 5.7 MHz bandwidth instead of 30 MHz. Yes I'll have to get a better aerial, anyone got a 2 or 3 meter dish going cheap?

I found one interesting thing though. You might think this part of the spectrum was free from all the hassles that plague us at 137 MHz, pagers, taxis, etc I did. And how wrong I was. Slap bang in the

middle of the satellite band is a whopping signal on day and night. A few miles along the Ayrshire coast from here, on top of a 900 foot hill, is a complex of microwave links sending, amongst other things, radar information to Oceanic control at Prestwick!!! I suspect the signal comes from the hill as it's at its strongest when I point the antenna in that direction, and I am more or less in line between the hill and Prestwick airport. However I am hoping when I get a decent antenna going it will have a narrow enough beamwidth to reduce the offending signal so it doesn't cause any trouble except when the satellite 'rises' or 'sets' over hill.
Presumably the transmission is legally entitled to be there, but it must lie the in signal pass band of NOAA 10, either that or it's second channel interference on 1416 MHz which I think is unlikely, or may be some other more obscure mechanism is at work; must find out what allocation for that part of the spectrum is.

So now the problem is to acquire enough signal to get above the threshold of the demodulator. The S band setup is the Microwave Modules converter and pre-amp with a home made loop yagi. They are only just adequate for Met 4; when Met 3 was in use with it's faulty EDA I had to modify the Maplin RX to reduce its bandwidth to the minimum to over come the 3 db drops in signal strength. I'm sure the MM system works fine with their antenna, or with a one meter dish, but my loop yagi is not so hot, (but then it cost me 3 pounds for a length of copper tube and the rings were made out of scrap H100 coax inner, instead of 150 to 300 pounds for a dish or equivalent). I obtained the Garex/Timestep pre-amp and after some modification put it ahead of the MM pre-amp. That made a considerable improvement to the APT signal, truly noise free pictures even with the wide setting on the Maplin RX and well worth getting. I hope to construct the LNA detailed in RIG 17 in due course and it will be interesting to see how they compare. However there is still to little signal coming in to give me a fair chance of getting NOAA HRPT pictures.
I didn't expect the loop yagi to give me enough signal, Bob Sansoni says a 1.4 meter dish is the minimum, so I am reading up how to build a dish and with my constructional techniques I'd better build a 2 meter version. Seems a wooden frame with chicken wire may do the trick.It'll have considerably lower wind loading than with a solid type, and when the wind gets up to 80 miles per hour plus on a winters night that's quite a consideration! Oh, and not forgetting to make it right circular, or I'll loose 3db gain, and then it has to be steered somehow, and may be It'll have to be put away afterwards so the planning boys don't get nasty!

The alternative is to construct a 4 loop yagi as described in the original Wireless World article, setting them up for right hand circular. It seemed to work for Mr Christienson, so it should work for me, especially as head amplifiers are considerably quieter than in 1980.
While pondering these problems, another thought occurred to me. Instead of the interminable wait for NOAA after an attempt of setting the system up, the digital transmissions from Meteosat 4 should give me a good idea of how well I am doing. The texts all quote a system performance of about 10.7 db / K for Meteosat, and Mr Christieson in his Wireless World article quotes his antenna gain at 27 db for NOAA. I don't quite understand what 10.7 db/ K means, but the impression I get is that if you receive Meteosat digital then the system is properly good enough for NOAA, especially when it is overhead and therefore at its closest (800 Km). So I hooked up the system to look at Meteosat 4, and there was evidence that another 3 db of antenna gain would be sufficient for the demodulator to lock on; it was trying very hard, and would lock on for a few seconds before drift somewhere caused it to loose lock. The demodulator signal, such as it was, unusable noisy of course, but with a little more gain it might step over the threshold.

To productively pass the time until I got the antenna problem licked. I built the Serial to Parallel Converter, and I found out how to get the clock 90 degrees apart. The system from 10.7 MHz IF to parallel out now works tolerably well even when given noisy signals generated by the simple subterfuge of not quite connecting the simulator output to the IF input. I'm still a little unsure of how well the clock is being generated, but time will tell.

This is as far as I have got to date; a simulator that works a treat, likewise the phase demodulator and serial to parallel converter, a bit conditioner thats got a few funnies to sort out, and an antenna that's a disaster. Next time I hope to have progressed to at least getting some signal out of the demodulator, then starts the hard bit (this has been easy!!!!). What do I do with the 10 bit parallel data at 665.4 K bits per second, apart from throwing away the two least significant bits? How do I store the receive the stored data? On disc? (a floppy would be filled in seconds). Get a hard disc for the Beeb? Record the data on a video?
This seems to be the most promising line of approach and initial experiments with the simulator have been extremely encouraging. Watch this space, but don't hold your breath!!!!!!!
Peter Hayes

Taming the LOK Image Selector
Ken Willis G8VR

Readers may have noted my cry for help in RIG 18 (September 1989, page 62) in getting my LOK sync board to work as the designer intended. It may help newcomers to the art of remote imaging if I summarise by saying that a few years ago, Les Currington G8LOK designed a circuit which at the push of a button or a flick of a switch, would select for display either the visual or infrared images being transmitted by the NOAA satellites (RIG No1 June 1985 Page 13).

Later G6ZOJ suggested adding LED's to provide a visual indication that the appropriate tones were being received (RIG No 2 September 1985 page 11). This same copy of RIG outlined some problems being experienced by users of the LOK circuit, and suggested how they might be over come. All the required information was reprinted in RIG 15 (December 1988 pages 12/13 and centre fold).

From the outset RIG offered members a PCB for this useful addition to the YU3UMV frame store. For convenience, this so called 'LOK board' pcb is host to three quite separate circuits. One is of course the Image Selector. The others being a crystal controlled 2400 Hz (to sync the Russian satellites), and finally, a circuit to provide right/left shift of the displayed picture.

In my case the 2400 Hz source and the line shift both worked first time. The image selector was a different story, and no matter what I did, it remained inoperative even though the filter on the board had been carefully set up using an audio oscillator and frequency counter.

I took all the steps suggested by G8LOK and G8CGK, namely, trying several 4093 chips, reducing the value of the 39 K resistor between the two filters to 27K, replacing the diodes by germanium OA47's and increasing the gain of the 741 op-amp by raising the 47K resistor (in series with the VR1) to 22K. In case anyone missed the other published mods to the original circuit details unused gates on IC3 should have their inputs (pins 5,6,8,9) connected and taken to ground through a 1K resistor, unused gates on IC2 should go to the 12 volt rail, also via a 1K resistor.

Nothing I did made any difference. The LED's did not flash and the push buttons might just as well have been disconnected since they produced not the slightest change in the picture displayed.

Grant Dixon in a letter to me, commented that he found the LOK board needed a fairly strong signal for it to work. Less Currington in RIG 2 referred to problems arising from a lack of input to the 4093's. These were the clues which, in a sustained attack on the problem, finally got my LOK board working about a week or so my plea for help appeared in RIG 18.

First of all, I made up to phase shift audio oscillators for 832 and 1040 Hz, using a borrowed frequency counter to set them up. I blush to say that having now exceeded my three score years and ten which the bible suggests is par for the course, I still tend to think in terms of valves rather than semi-conductor devices, and I have a very large stock valves which I like to use whenever possible. Consequently my PSO's were the two halves of a double triode feeding into a shared 6C4 triode cathode follower. The result was a juicy source of the two required tones. By including a change over switch between the PSO's and the cathode follower, I could provide either tone separately, or flick between the two oscillators to produce a sound like the siren of an emergency vehicle. I recorded the tones on tape and now had a convenient source to drive my LOK board, which I removed from the frame store system to be tested separately.

Having no oscilloscope (and my ballistic galvanometers having long since seized up with age) I bowed to the 20th century and made up a small audio amplifier using a LM318 chip feeding into a miniature speaker. A short length of wire connected to the input of this amplifier via a resistor to increase input impedance served as a probe enabling me to prod around the LOK circuit to check audio levels at various points. It was soon obvious that while there appeared to be reasonable audio at the centre point of both the 832 and 1040 Hz filter sections, in both cases the output to the diodes was extremely low. Things improved when the centre resistor (originally 39K, but already changed to 27K), was further reduced to 18K, but more gain was clearly needed. One unexpected advantage of this 'audio probing' was that it became very easy to peak the filter by feeding them in turn with a steady tone (from the tape) at the required frequency as the potentiometers were adjusted for maximum audio output, but when doing this the probe must not load the filter circuit too heavily

Since the gain of the 741 op amp had already been much increased, I thought that one solution might be to find a higher input level for the board. The information supplied with the LOK board shows its input taken from the top of R107 on frame store board 1.

What would be the effect, I mused, if the board was feed from the full APT input to the frame store?

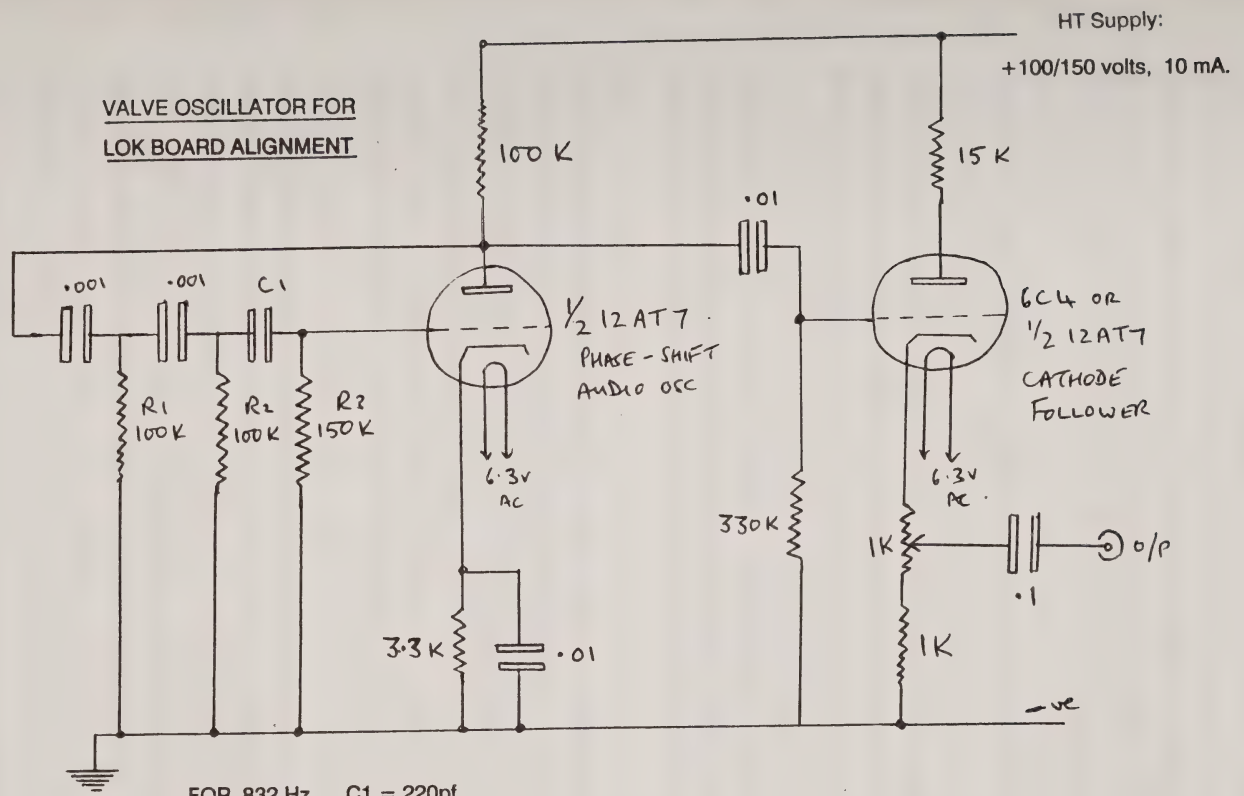
This could easily be achieved by taking the input not from the top of R107, but from the top of R101. When this simple change was made, the effect was dramatic and to my great surprise and delight the board now worked perfectly. Pressing a push button now causes the scroll to halt. On releasing the button the scroll recommences with the picture now locked on to the visual or IR image, according to the selection made.

With everything working now according to plan, I have not felt disposed to restore the board to its original component values to see whether it would have worked 'as is' when connected the top of R101 but for anyone experiencing problems with this board I would most certainly suggest trying this change first of all before altering any of the prescribed component values.

Since not everyone has excess to sophisticated test equipment, I have included my phase shift oscillator circuits for those who still like to play with valves, though Grant Dixon's LOK tester (RIG 13 June 1988 page 18) is a more modern way of providing the required tones if no calibrated audio oscillator is available when you come to line up the LOK board filters. Maybe there is a case for the RIG to offer for sale to members a tape recording of some of the audio tones which would assist in the setting up of a frame store. Meanwhile, should anyone need a tape with the 832/1040 Hz signals helpful in adjusting this board, send me a blank cassette and return postage (G8VR QTHR).

Incidentally there was a miss print in my letter to RIG 18 which suggests I get good pictures from North America on my system. No such luck, It should have read North Africa !

PS From the editor:
Members who are not radio enthusiasts or who do not have access to a call-book may send their requests for a tape to Ken via me.



FOR 832 Hz C1 = 220pf
FOR 1042 Hz C1 = 390pf

Adjust frequency by putting high resistors (250 - 500k)

across R1, R2 or R3 (only one necessary)

Starting Out

Following your plea for tales on beginners experiences in learning about and developing a weather satellite system, I thought I should relate how I have fared since last November, when I first heard about the possibilities of imaging the planet, at home, on a day to day bias. For gentle guidance and information, I am indebted to a fellow RIG member and colleague at work who has kept me on the correct wave length throughout.

I was lent a copy of Cirkit's Satpic display program for my BBC micro and given a decoder circuit to build my self. A dubbed copy of a Meteosat APT signal on tape provided something to work on while I got the decoder up and running. When I got my first picture on the screen, I discovered the importance of synchronisation, My line sync pulse were being generated by dividing down the output of a crystal and this bore no sync relationship to what was coming of the tape. Bear in mind when sniggering at this obvious fact (as I am doing just now) that I was clueless as to what was expected to get these pictures right. At one point I was using a posh tape deck with a varispeed control to keep the sync pulse going down one side of the screen!

The application notes for the national semiconductors LM565 PLL included a circuit to generate a square wave from the APT 2.4KHz subcarrier which would track the variations in the off tape frequency. It also suggested dividing the frequency of this wave form by 600 to give a line pulse. This technique is, I think, well known among RIG members but it was a revelation to me, depending as it did on there being EXACTLY 600 subcarrier cycles in a line of NOAA and Meteosat video.

By this time I was thinking on the problems of reception. I had a little multi band radio, made in Hong Kong, about ten years ago to monitor the burgeoning CB craze (I was a lad then) and one of its bands covered 108-176 MHz. Being no radio amateur, I was unaware that it had about as much selectivity as a barn door but proceeded with attempts to receive NOAA 9 and 10 without success. This lead me to the conclusion that what I really needed was a scanner. You could dial in the frequency you wanted and away you go; Couldn't you? I learned that it probably would work though the band width might be restricted. Anyway it was the excuse my father had been waiting for a long time to hear and he went out to get that long promised scanner which he lent to me.

This receiver, the Realistic PRO-2004, couldn't handle infrared pictures or peak white areas like clouds in the visible images but one of my early attempts with it yielded a view of the Brest peninsula using its own telescopic antenna!

Meanwhile, some magazine articles poorly taught me the rudiments of polar orbits and I discovered the telephone information run by 'Weather Watch UK'. A few evenings spent head scratching and calculator bashing lead to a spread sheet in my Beeb micro which, when fed with a reference orbit, lists all the useful south bound passes by NOAA 10 and 11 for a week and a half. I still haven't cracked the south bound passes.

My colleague showed me how one goes about designing a crossed dipole and I rustled one up quite easily from spare lengths of aluminium, a plastic box and some cable and very nice it looks straddling the trusses in our loft. I've received pictures from the Alps to the Faroes but the reception pattern is poor with null points just as the satellite reaches dear old Bonnie Scotland. Nowadays, the shortcomings of this antenna are very apparent and improving it will be a project for the future as well as another learning experience.

Things were going well by this time. I knew when the satellite would pass, northbound anyway, I could receive and tape its pictures. I had sync pictures on the micro and I could decode every theoretical pixel and print it out, though I needed 6 sheets of paper to show the British Isles and the full width of the NOAA image with eight grey levels. Very good but things could be better.

I heard about RIG and promptly joined having read a news letter and saw what could be achieved. I must comment on the printed photographs in the newsletters which are both an education and inspiration, giving one a taste of what is possible. Anyway, every issue I saw seemed full of mentions of frame stores. Now there was something I new about ! As a videotape operator in broadcasting, I use frame-stores regularly for timebase correction, storing still pictures and for video effects and I know the fundamentals of how they work and so the germ of building my own frame store took root.

My colleague had already built his own frame store and he gave me some pointers as to which way I should start. However I wanted a more elegant solution to the design problem and my colleague is of the Christmas tree school of electronic construction. How big should the memory be ? How many grey levels?

Should I use a static or dynamic memory? How do I generate the T.V. synchronising pulses? Will my long suffering wife let me build it at all, once she hears the price? Six months on I had done the basic design work and built the major sections for a reasonable cost.I'm glad to say that it work nearly first time and I fixed the major bugs in a day. Since then I've ironed out the wrinkles in the design and now I have a frame store which gives excellent results on both NOAA and Meteosat formats.

I've learnt much in the last ten months but there are great gaps in my knowledge. How does one use Keplerian elements? How is Russian APT formatted and how does one drive line sync for it? Dividing the subcarrier by 600 or 1200 doesn't seem to work. What is the practical theory, if you know what I mean, behind antenna design. I need to improve my aerial and remove the null points in its pattern. What about other designs like the quadrifiliar helix and is it any better?
How would one go about building a dish and feed horn for Meteosat/Goes reception? Could one dump large amounts of data from a lump of memory to a disk drive? So much to know. There are many topics related to our subject which I'm sure a lot of members could write about.

The frame store forms a good core to my developing system. I now have a second hand Maplin receiver which, while giving far superior pictures when compared to the scanner, especially in infrared, suffers from interference, not from pagers but from poorly suppressed passing cars and someone's voice while on a walkie talkie.
I use an old ghetto blaster to record the satellite passes but the agc plays hell with them when the interference strikes. One day I hope to use a video machine to both record the satellite on FM sound tracks using the timer and to record for posterity the video pictures once they are in the frame store. I'll have them set to music next!! The computer has returned to its word processing and accounting duties and I look forward to affording more memory for the frame store.

I will be able to supply details of the frame store if anyone requires it, once I catch up with the paper work on it.

DETAILS OF NOAA PREDICTIONS:

NOAA '10'
PERIOD 101.223193456123 MINUTES
INCR 25.30643034490644 DEGREES

All morning passes are southbound, evening passes are northbound.
Frequency 137.50MHz. INCRement is degrees change per orbit.

NOAA '11'
PERIOD 102.0878245984205 MINUTES
INCR 25.52159303327789 DEGREES

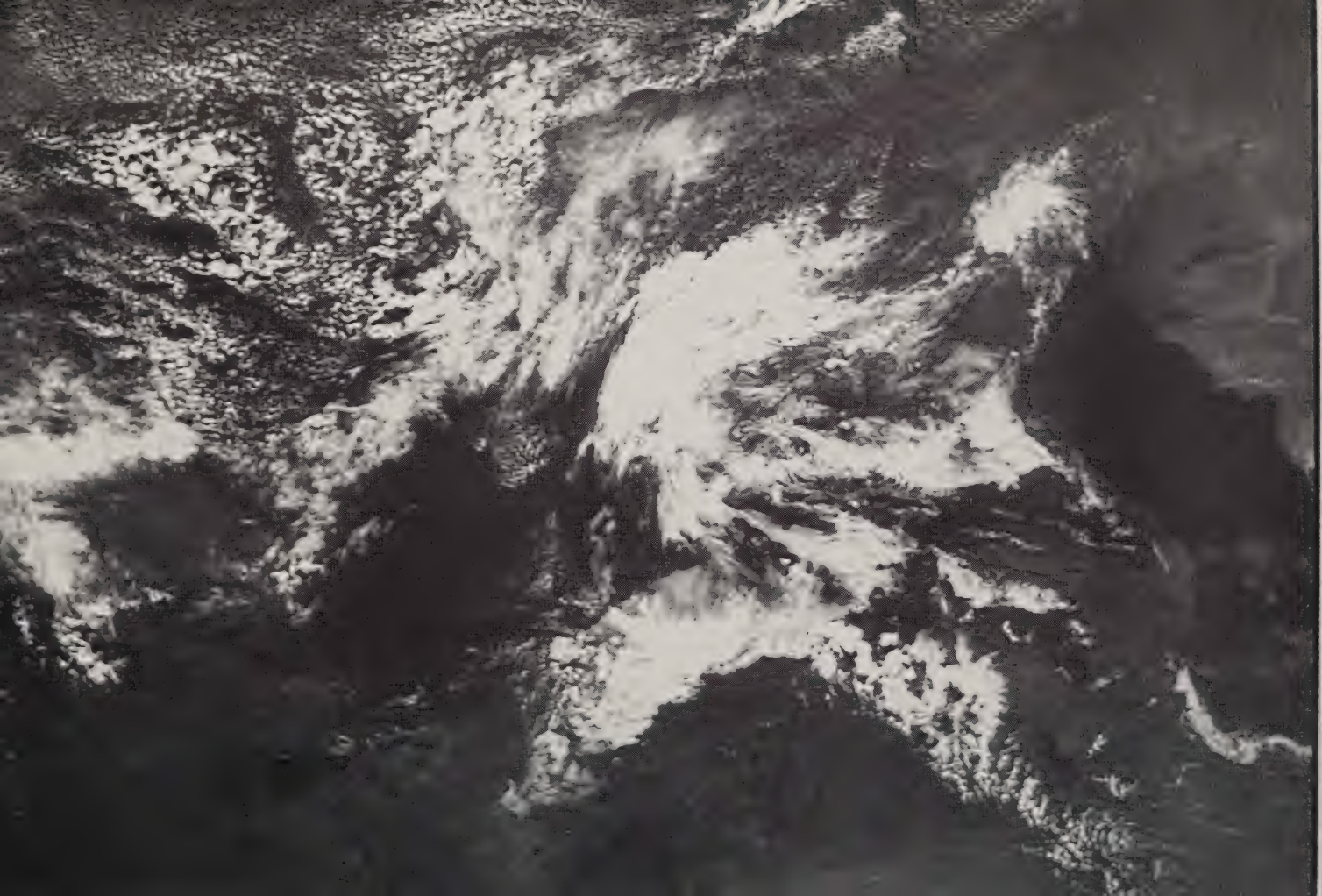
All morning passes are southbound, afternoon passes are northbound.

Frequency 137.62MHz. INCRement is degrees change per orbit.

Eds Note: Apologies for the wavy columns in the predictions, I'm still trying to find a way to put the TABS in automatically in the data

NOAA 10: (see reverse for increment details)

1/01 190 08:09	31/01 347 18:39	1/03 334 17:43	31/03 340 18:05
1/01 342 18:16	1/02 190 08:08	2/03 353 19:01	1/04 182 07:35
2/01 184 07:46	1/02 342 18:16	3/03 348 18:38	1/04 334 17:42
2/01 336 17:54	2/02 184 07:46	4/03 190 08:08	2/04 353 19:00
3/01 330 17:31	2/02 336 17:53	4/03 342 18:15	3/04 348 18:38
4/01 350 18:49	3/02 330 17:30	5/03 184 07:45	4/04 190 08:07
5/01 344 18:26	4/02 350 18:48	5/03 336 17:52	4/04 342 18:15
6/01 187 07:56	5/02 344 18:26	6/03 330 17:30	5/04 184 07:44
6/01 338 18:03	6/02 187 07:55	7/03 350 18:48	5/04 336 17:52
7/01 181 07:33	6/02 339 18:03	8/03 344 18:25	6/04 331 17:29
7/01 333 17:40	7/02 181 07:32	9/03 187 07:55	7/04 350 18:47
8/01 352 18:59	7/02 333 17:40	9/03 339 18:02	8/04 344 18:24
9/01 347 18:36	8/02 352 18:58	10/03 181 07:32	9/04 187 07:54
10/01 189 08:06	9/02 347 18:35	10/03 333 17:39	9/04 339 18:02
10/01 341 18:13	10/02 189 08:05	11/03 353 18:58	10/04 181 07:31
11/01 183 07:43	10/02 341 18:12	12/03 347 18:35	10/04 333 17:39
11/01 335 17:50	11/02 183 07:42	13/03 189 08:04	11/04 353 18:57
12/01 355 19:08	11/02 335 17:50	13/03 341 18:12	12/04 347 18:34
13/01 349 18:46	12/02 330 17:27	14/03 184 07:42	13/04 189 08:04
14/01 343 18:23	12/02 355 19:08	14/03 335 17:49	13/04 341 18:11
15/01 186 07:52	13/02 349 18:45	15/03 330 17:26	14/04 184 07:41
15/01 338 18:00	14/02 343 18:22	15/03 355 19:07	14/04 336 17:48
16/01 332 17:37	15/02 186 07:52	16/03 349 18:44	15/04 330 17:25
17/01 351 18:55	15/02 338 17:59	17/03 344 18:22	15/04 355 19:07
18/01 346 18:32	16/02 332 17:36	18/03 186 07:51	16/04 349 18:44
19/01 188 08:02	17/02 352 18:55	18/03 338 17:59	17/04 344 18:21
19/01 340 18:10	18/02 346 18:32	19/03 332 17:36	18/04 186 07:51
20/01 183 07:39	19/02 188 08:02	20/03 352 18:54	18/04 338 17:58
20/01 334 17:47	19/02 340 18:09	21/03 346 18:31	19/04 332 17:35
21/01 354 19:05	20/02 183 07:39	22/03 189 08:01	20/04 352 18:54
22/01 348 18:42	20/02 334 17:46	22/03 340 18:08	21/04 346 18:31
23/01 343 18:19	21/02 354 19:04	23/03 183 07:38	22/04 189 08:00
24/01 185 07:49	22/02 348 18:42	23/03 335 17:46	22/04 340 18:08
24/01 337 17:56	23/02 343 18:19	24/03 354 19:04	23/04 183 07:38
25/01 331 17:34	24/02 185 07:48	25/03 349 18:41	23/04 335 17:45
26/01 351 18:52	24/02 337 17:56	26/03 343 18:18	24/04 354 19:03
27/01 345 18:29	25/02 331 17:33	27/03 185 07:48	25/04 349 18:40
28/01 187 07:59	26/02 351 18:51	27/03 337 17:55	26/04 343 18:18
28/01 339 18:06	27/02 345 18:28	28/03 331 17:32	27/04 185 07:47
29/01 182 07:36	28/02 188 07:58	29/03 351 18:51	27/04 337 17:55
29/01 334 17:43	28/02 339 18:06	30/03 345 18:28	28/04 332 17:32
30/01 353 19:02	1/03 182 07:35	31/03 188 07:58	29/04 351 18:50



RIG SUBSCRIPTION 1990 - RENEWAL

If you would like to renew your membership of the group and continue to receive the newsletter then please complete the form below not forgetting to complete the survey and send it to Des Watson our membership secretary whose address is below.

Recent joiners are reminded that the subs run from January to December and unless you specifically paid in advance for 1990 then your subs are due now. If our records show that you have already paid for 1990 then the label on the envelope containing this newsletter will say "PAID 90".

The fees for 1990 are as follows:

UK membership		£6.00
European membership	(£6.00 + £2.00 post)	£8.00
Outside Europe	(£6.00 + £3.00 post)	£9.00

(All non UK post will be sent by air mail)

Cheques must be made payable to "REMOTE IMAGING GROUP".
Send your completed form (including the completed survey) to:

Mr. Des Watson, SUBS 90
Norton,
Gote Lane,
Ringmer,
Near Lewes,
East Sussex, BN8 5HX
ENGLAND

NAME: _____ CALL SIGN _____

ADDRESS: _____

_____

_____ POST CODE _____

COUNTRY _____

When writing in to the group please use your callsign if you have one. (Doc ref RG-SUB90 2 Dec 89)

PTO

MEMBERSHIP SURVEY AT END OF 1989

In order to understand what current/new members of the RIG are currently interested in we have compiled the questions below which we hope all members will complete. This survey is conducted every year and the results published in the newsletter.

Please feel free to add any futher comments or suggestions on the reverse side of the survey form:

Yes/No

1 Are you currently receiving weather satellites on VHF? ___

2a Are you receiving Meteosat IV ? ___

2b If yes, what kind of aerial? (Dish? Yagi?) _____

2c Also, what make of downconverter? (Dartcom?, LMW?...) _____

3 Are you receiving HRPT from NOAA or are you a PDUS for Meteosat? ___

4 Are you involved in education?: ___

5 What display equipment do you use: Photographic fax ? ___

micro computer?___ normal fax?

Spacetech/Archimedes? ___ YU3 framestore?

Other? ___

6 Do you use a micro computer for weather satellite work? ___

If yes which one?: _____

For what applications (display? predictions?) _____

7 For UK members only

Do you object to your name and address details

a) being held on a computer? ___

b) being given to RIG members in your vicinity? ___

8a Do you suffer from any forms of interference? ___

8b If yes to 8a), has it changed since the last survey? ___

9 Do you think the group should spend circa £300 in order to attend the RSGB NEC Rally in 1990? ___

RIG SHOP CORNER

Meteosat Downconvertor:-

a) Assembled and tested module in tin plate box:-
£129.69 + £1.50 p&p.

b) Complete mounted in weather proof box:-
£157.96 + £3.00 p&p.

Waterproof power and channel change connector £10.00 extra if required, but note these functions can all be done via the coaxial downlead.

RIG VHF Scanning Receiver

a) Basic receiver module, with LED Channel number display, fully assembled and tested
£112.55 + £1.50 p&p

b) Same module as above but with liquid crystal frequency display module replacing the LED Channel display.
£151.57 + £1.50 p&p

Cheques for above units payable to 'DARTCOM' please

Items below available from the secretary:
The **RIG VHF preamp** also available includes a bandpass filter and is ideal for mast-head mounting. It is available from the secretary as a built and aligned PCB measuring 85mm by 33mm (3 5/16 x 1 15/16 inches). Module including first class post £13.37

28 page booklet entitled: Introduction to Weather Satellites & their Reception by Mike Mansfield. £2.50

Parts for **Low noise Amplifier** - see RIG 18 £30.00

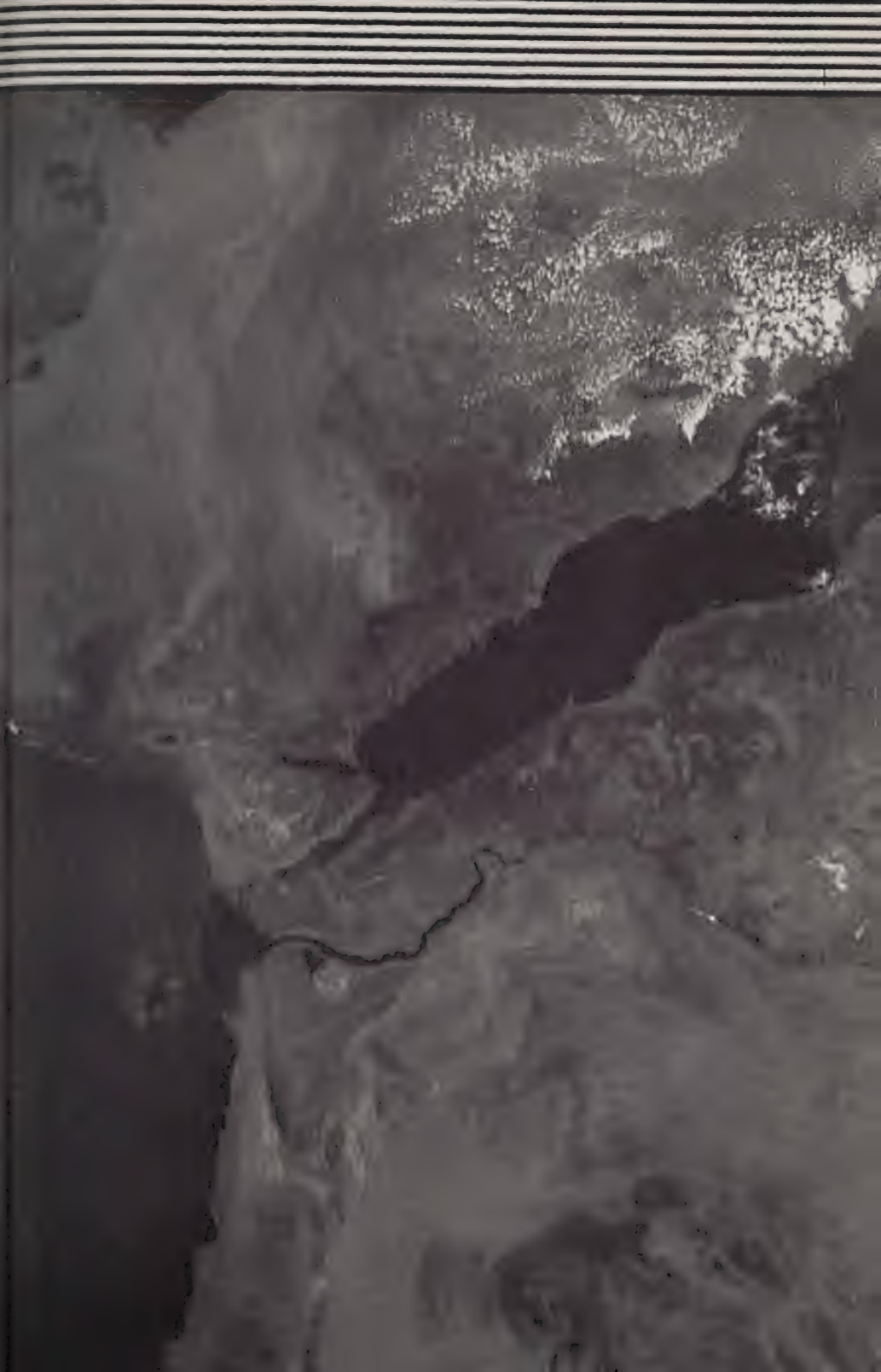
David Juett YU3 i/f s/w for IBM PC & clones £6.50

Cheques payable to "Remote Imaging Group" please

FRAMESTORE PCBS:
The 001 board of the YU3 framestore design is currently being extensively revised to include buffered 8 bit A-D outputs and ctrl signals, a new Sample & Hold chip, LED activity indicators on all 8 bits and the incorporation of external controls for the A-D chip. After considerable delays, the boards will be ready in Jan 1990. Enquiries incl. sae to the secretary please.

Newsletter Deadlines

Some of you wishing to send articles in for publication, might like to know that the Newsletter deadlines (more like panics) are mid month previous to cover date i.e. mid February for March, mid May for June, mid August for September and mid November for December. These are only guides but the secretary really requires advance notice of articles please.



NOAA 11: (see reverse for increment details)

1/01 183 02:10 30/01 182 02:03 2/03 353 13:30 2/04 346 13:03
1/01 336 12:22 30/01 335 12:16 3/03 350 13:20 3/04 190 02:40
2/01 181 01:59 31/01 332 12:05 4/03 348 13:09 3/04 343 12:52
2/01 334 12:11 1/02 355 13:37 5/03 345 12:58 4/04 188 02:29
3/01 331 12:01 2/02 352 13:26 6/03 189 02:35 4/04 341 12:41
4/01 354 13:32 3/02 349 13:15 6/03 342 12:47 5/04 185 02:18
5/01 351 13:21 4/02 347 13:04 7/03 187 02:24 5/04 338 12:31
6/01 348 13:10 5/02 344 12:53 7/03 340 12:37 6/04 182 02:07
7/01 346 13:00 6/02 188 02:30 8/03 184 02:13 6/04 335 12:20
8/01 190 02:36 6/02 341 12:43 8/03 337 12:26 7/04 333 12:09
8/01 343 12:49 7/02 186 02:19 9/03 181 02:03 8/04 330 11:58
9/01 187 02:26 7/02 339 12:32 9/03 334 12:15 8/04 355 13:40
9/01 340 12:38 8/02 183 02:09 10/03 332 12:04 9/04 353 13:30
10/01 185 02:15 8/02 336 12:21 11/03 354 13:36 10/04 350 13:19
10/01 338 12:27 9/02 333 12:10 12/03 352 13:25 11/04 347 13:08
11/01 182 02:04 10/02 331 12:00 13/03 349 13:14 12/04 345 12:57
11/01 335 12:16 11/02 353 13:31 14/03 346 13:03 13/04 189 02:34
12/01 332 12:06 12/02 351 13:20 15/03 344 12:53 13/04 342 12:46
13/01 330 11:55 13/02 348 13:09 16/03 188 02:29 14/04 186 02:23
13/01 355 13:37 14/02 345 12:59 16/03 341 12:42 14/04 339 12:36
14/01 352 13:26 15/02 189 02:35 17/03 185 02:18 15/04 183 02:12
15/01 350 13:15 15/02 343 12:48 17/03 338 12:31 15/04 337 12:25
16/01 347 13:05 16/02 187 02:25 18/03 182 02:08 16/04 181 02:02
17/01 344 12:54 16/02 340 12:37 18/03 336 12:20 16/04 334 12:14
18/01 188 02:31 17/02 184 02:14 19/03 333 12:09 17/04 331 12:03
18/01 342 12:43 17/02 337 12:26 20/03 330 11:59 18/04 354 13:35
19/01 186 02:20 18/02 181 02:03 21/03 353 13:30 19/04 351 13:24
19/01 339 12:32 18/02 335 12:16 22/03 350 13:19 20/04 349 13:13
20/01 183 02:09 19/02 332 12:05 23/03 348 13:08 21/04 346 13:02
20/01 336 12:22 20/02 355 13:36 24/03 345 12:58 22/04 190 02:39
21/01 333 12:11 21/02 352 13:25 25/03 189 02:34 22/04 343 12:52
22/01 331 12:00 22/02 349 13:15 25/03 342 12:47 23/04 187 02:28
23/01 354 13:31 23/02 347 13:04 26/03 186 02:24 23/04 341 12:41
24/01 351 13:21 24/02 344 12:53 26/03 339 12:36 24/04 185 02:18
25/01 348 13:10 25/02 188 02:30 27/03 184 02:13 24/04 338 12:30
26/01 346 12:59 25/02 341 12:42 27/03 337 12:25 25/04 182 02:07
27/01 190 02:36 26/02 185 02:19 28/03 181 02:02 25/04 335 12:19
27/01 343 12:48 26/02 338 12:31 28/03 334 12:15 26/04 332 12:09
28/01 187 02:25 27/02 183 02:08 29/03 331 12:04 27/04 330 11:58
28/01 340 12:38 27/02 336 12:21 30/03 354 13:35 27/04 355 13:40
29/01 184 02:14 28/02 333 12:10 31/03 352 13:24 28/04 353 13:29
29/01 337 12:27 1/03 330 11:59 1/04 349 13:14 29/04 350 13:18

GAREX ELECTRONICS

***** TIMESTEP WEATHER SATELLITE SYSTEMS *****

SPECTACULAR NEW ATARI *ANIMATED* SYSTEM Garex are proud to announce that they are the first appointed dealer for this incredible new Timestep product. Following on from Timestep's phenomenal success in the education market, a special low cost Atari ST version of their *animation* system is now available from stock. Simply plug in your existing receiver to view amazing pictures. For the ultimate add a Meteosat receiver for unbelievably smooth 14 frame *animation* that is completely automatic once set up. Just watch the clouds roll by ! New pictures are added twice an hour if required, the oldest being discarded automatically. This sophisticated package will run on any Atari ST1040 and compatible colour monitor. Complete with all software and colour-keyed Atari interface. This equipment is of such high quality that Atari UK exhibited it on their stand at Which Computer 1989 !
Interface and software, just connect your existing receiver. £299.00
Optional colour to 16 grey scale adaptor. £24.95
For those who would like a one-stop-shop, the complete package ready-to-run :
Meteosat Dish, Pre-Amp and Receiver, 43M cable, Atari Interface, Grey Scale Adaptor, 14" Colour Monitor, Atari ST1040, Software (including demonstration disc) and, of course all other cables and connectors. On your doorstep £1,695.00

COMPACT FRAMESTORE SYSTEM The *BASIC* MICROWAVE METEOSAT system. For no complications a complete plug in and go package that requires no computer, no software, no extra monitor and can be up and running, including dish alignment within 10 minutes of receipt. 256 x 256 pixels and Timestep's digital 64 grey level output gives outstanding results. This is the system that the London Science Museum has chosen to display in the new Space and Exploration Gallery, for the next 12 years !. Stop press. Did you notice this equipment giving **totally** noise free pictures live at Sandown Park ?.
Nothing more to buy:
Meteosat Dish, Pre-Amp and Receiver, 43M cable, Framestore, 12" B/W Monitor and, of course all other cables and connectors. £995.95
Also available less monitor. £885.00

AMIGA AMIGA AMIGA !! Available from stock now. Amazing 600x400 pixels in 16 shades of grey on a standard monitor. Runs on any A500 1Mb. Interface and software only £299.00. Use your existing receiver !.

IBM IBM IBM STOP PRESS !!! See the Timestep advert for this systems to put all others in the shade.

SATELLITE ACCESSORIES

Meteosat receiver. Dish input and 2 watt audio output. £270.25
Meteosat Pre-amp. 15dB gain 0.6dB noise figure GaAs FET. £92.00
Meteosat dish, 0.9M with feed horn. £199.00
10M H100 fitted N connectors. £29.85
NOAA *BASIC* Turnstile antenna, ready wired phasing harness and a connector fitted, complete with mast bracket. £39.95
NOAA *BASIC* Pre-amp, 3 pole filtering, boxed and fitted with connectors, 14dB gain 1.0dB noise figure, for the Turnstile antenna. £24.95
NOAA cable, 50M high quality cable fitted with connectors. £24.95

ALL PRICES INCLUDE UK P&P AND 15% VAT.
***** ACCESS & VISA WELCOME *****

GAREX ELECTRONICS
HARROW HOUSE AKEMAN STREET TRING HP23 6AA
Tel. Tring (044282) 8580 and Cheddington (0296) 668684
Callers by appointment.

Here are some of its specifications :-

1. 512 samples to a line

2. Expandable to 1024 samples to a line

3. 1024 lines to a picture

4. 256 grey levels

5. Full spec TV sync output

6. Fully interfaced scan

7. 10:1 zoom for both x and y axes

8. Shift in x and y direction

9. Pictures can be flipped in x and y direction

10. The design easily leans its self to modification, perhaps to output to a fax machine.

It ha been built on four boards using a combination of veroboard and verowire techniques. I am at present using my original decoder with a few modifications. A new version will be designed and built as my next project. The heart of the machine is the memory control board which generates and controls the read and write addresses for memory. The memory is housed between two long strips of veroboard and carries sixteen 32K x 8 bit static chips, as though yet I only have two chips with three more on the way. The final board carries TV sync pulse generate, D to A convertor and circuitry to combine video and syncs.

David Woods.

THE RUSSIAN SATELLITE SCENE
by Les Currington, G8LOK

During the last few months of Soviet Weather Watch we have seen very little activity; but we watch with keen anticipation in the expectation of a new launch, especially as the new OKEAN was long overdue.

Well our waiting was over when on the 25 Oct 89 at 21.14 Hrs the ever watchful James Brown heard what appeared to be a new Meteor giving IR scan; on confirming with Geoff Perry it was established that a new Meteor, 3-03 had been launched. Since then excellent pictures have been seen in IR; not until early January will we be able to see a visible picture in the U.K.
It probably would be wise to mention that while compiling the report on the Meteors, comments made refer to the activity at the time of writing. in this case 30 Nov 89; by the time RIG is published all Meteors would be in an orbital plane approximately two hours earlier.

Okean **88-56A** **137.4MHz**
This Oceanographic Satellite has not been heard for some considerable time until James Brown heard a short pass in September.

Meteor 2/16 **87-68A** **137.4MHz**
During the ascending morning pass of 29 Nov 89 excellent pictures were received showing the recent fall of snow in eastern Europe, also thick fog covering a large part of Italy.

Meteor 2/17 **88-05** **137.30 MHz**
Now in a early morning pass and not transmitting due to lack of solar illumination.

Meteor 2/18 **89-18** **137.85 MHz**
Meteor 2/18 continues to give excellent pictures on a mid morning near overhead ascending pass.

Meteor 3/02 **88-64A** **137.30 MHz**
Not heard for several weeks.

Meteor 3/03 **89-86A** **137.85 MHz**
Transmitting excellent IR.

KEPLER ELEMENTS provided by Max White

ROYAL GREENWICH OBSERVATORY, HERSTMONCEAUX CASTLE

	NOAA 9	MET 2-17	MET 3-03
	137.62 MHz	137.30 MHz	137.85 MHz
	84-123 A	88-05 A	89-86 A
EPOCH OF DATA	89321.248208	89322.357384	89322.293150
ACCELERATION	0.00001477	0.00000337	0.00000361
REV NO	25406	9101	321
INCLINATION	99.156	82.544	82.554
R. A. NODE	311.326	158.044	6.748
ECCENTRICITY	0.001440	0.001589	0.001679
ARG OF PERIGEE	243.023	193.687	133.027
MEAN ANOMALY	116.946	166.386	227.226
MEAN MOTION	14.1229125	13.8424505	13.158410

	MET 3-02	NOAA 11	NOAA 10
	137.3 MHz	137.62 MHz	137.50 MHz
	88-64 A	88-89 A	86-73 A
EPOCH OF DATA	89321.745697	89321.284781	89321.280514
ACCELERATION	0.00000391	0.00001439	0.00001315
REV NO	6312	5907	16446
INCLINATION	82.539	98.956	98.625
R. A. NODE	67.026	264.707	348.783
ECCENTRICITY	0.001755	0.001243	0.001384
ARG OF PERIGEE	117.458	156.745	162.270
MEAN ANOMALY	242.829	203.427	197.896
MEAN MOTION	13.1686620	14.1128449	14.2329384

	MET 2-18	MET 2-16
	137.3 MHz	137.4 MHz
	89-18	87-68 A
EPOCH OF DATA	89323.214277	89323.322799
ACCELERATION	0.00000117	0.00000218
REV NO	3652	11396
INCLINATION	82.523	82.552
R. A. NODE	35.750	96.626
ECCENTRICITY	0.001301	0.001302
ARG OF PERIGEE	231.903	116.415
MEAN ANOMALY	128.166	243.839
MEAN MOTION	13.8388121	13.8354410

Reference Orbits for Russian Satellites supplied by Dick Boardman

These are the times of north going equator crossing (in GMT) and longitudes (in degrees west) for four Russian satellites.
They are given at weekly intervals together with the period and the change in longitude per orbit.

MET 2-17 137.30 MHz
period 104.091 minutes increment 26.09 degrees

23 DEC 03:00 005	30 DEC 01:32 356	06 JAN 01:49 012
13 JAN 00:21 003	20 JAN 00:38 019	26 JAN 23:09 010
02 FEB 21:42 000	09 FEB 21:58 017	16 FEB 20:31 007
23 FEB 19:03 358	02 MAR 19:20 014	09 MAR 17:52 005
16 MAR 16:25 355	23 MAR 16:40 012	30 MAR 15:13 002
06 APR 15:29 019	13 APR 14:02 009	20 APR 12:34 000

MET 2-18 137.85 MHz
period 104.122 minutes increment 20.26 degrees

23 DEC 18:35 002	30 DEC 18:54 019	06 JAN 17:29 010
13 JAN 16:04 001	20 JAN 16:23 019	27 JAN 14:58 010
03 FEB 13:33 001	10 FEB 13:51 018	17 FEB 12:26 009
24 FEB 11:01 000	03 MAR 11:21 017	10 MAR 09:56 008
17 MAR 08:31 000	24 MAR 08:50 017	30 MAR 07:25 008
07 APR 05:59 359	14 APR 06:18 016	21 APR 04:53 007

MET 3-02 137.30 MHz
Period 109.407 minutes increment 27.46 degrees

23 DEC 21:52 018	30 DEC 19:49 359	06 JAN 19:34 007
13 JAN 19:20 015	20 JAN 17:15 356	27 JAN 17:00 004
03 FEB 16:47 012	10 FEB 16:32 021	17 FEB 14:28 001
24 FEB 14:13 010	03 MAR 13:59 018	10 MAR 11:55 359
17 MAR 11:41 007	24 MAR 11:26 015	31 MAR 09:23 356
07 APR 09:08 004	14 APR 08:54 012	21 APR 08:39 021

MET 3-03 137.85 MHz
Period 109.50 minutes increment 27.46 degrees

23 DEC 17:26 011	30 DEC 17:19 021	06 JAN 15:23 004
13 JAN 15:17 014	20 JAN 13:20 357	27 JAN 13:14 007
03 FEB 13:08 017	10 FEB 11:11 000	17 FEB 11:05 010
24 FEB 10:58 020	03 MAR 09:01 003	10 MAR 08:55 013
17 MAR 06:59 356	24 MAR 06:53 006	31 MAR 06:46 016
07 APR 04:50 359	14 APR 04:44 009	21 APR 04:36 019

YU3UMV FRAME STORE and 20 lpm

The Russian Meteor series satellites have for some time now been transmitting night time IR pictures at 20 lines/min. With the standard 2400Hz sync signal these pictures can be displayed on the YU3UMV frame store with a small modification. A bit of theory on how the frame store times itself with the 2400Hz signal. The 2400 signal is used to phase lock the 38.4KHz vco. This 38.4KHz is divided by 2,4,8 in I104 to produce the desired zoom ratio and this is then used as the bit clock (in PT117 out PT114). The bit clock is further divided by 8 to produce the pixel clock, by 16 to produce the Meteor line clock by 32 to produce the NOAA line clock (all by I109).

The selected line clock is divided by 30 to get the line rate. The display shows 256 samples with the remaining 44 on a line not being stored. The frequencies are as below:-

		bit clk pt117	Met-IR pixel clk pt115	Meteor line clk pt109	NOAA line clk pt110	line clk pt111
pt104	x2	19.2	2400	4800	1200	600
pt105	x1	9600	1200	2400	600	300
pt106	x.5	4800	600	1200	300	150

Zoom selection sampling times corresponding line rates:

x2	106mS	16Hz	4Hz	2Hz
x1	213mS	8Hz	2Hz	1Hz
x.5	426mS	4Hz	1Hz	.5Hz

The original article suggests the use of PT 109 to provide a ratio of 150 between the pixel clock and line rates for the Met-IR 20 line/min. Unfortunately things are not that straight forward.

NOAA	120 line/min is a line per	500mS
Meteor	240 line/min is a line per	250mS
Met-IR	20 line/min is a line per	3 seconds

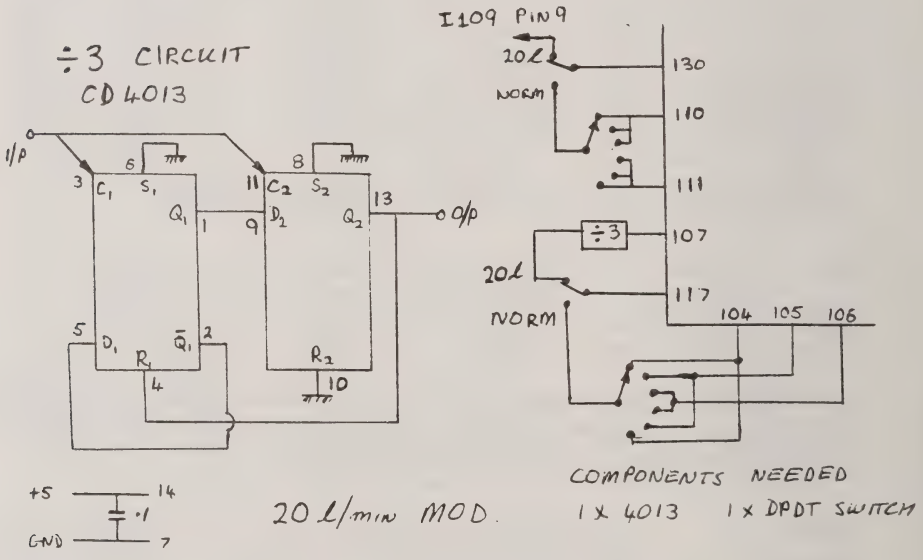
NOAA	x1	213ms is displayed & sample every 2nd line
NOAA	x2	106mS is displayed & sample every line
Meteor	x2	106mS is displayed & sample every line

From this it can be seen that you can increase the sample rate and blow an area of the picture up but you can not increase the line rate to be above the incoming line rate. This is what happens if you use pt 109 to generate the bit clock for MET 20 line/min. Also the required line rate of 20 line/min is not an even division from the normal line rates.

My suggested solution is this.

Take pt 107 (2400Hz) and divide it by three to produce the bit clock (800Hz). The pixel clock is then 100 Hz and the 256 samples take 2.56 seconds. The line clock is taken from I109 pin 9 and results in every line being sampled. The circuit is below.

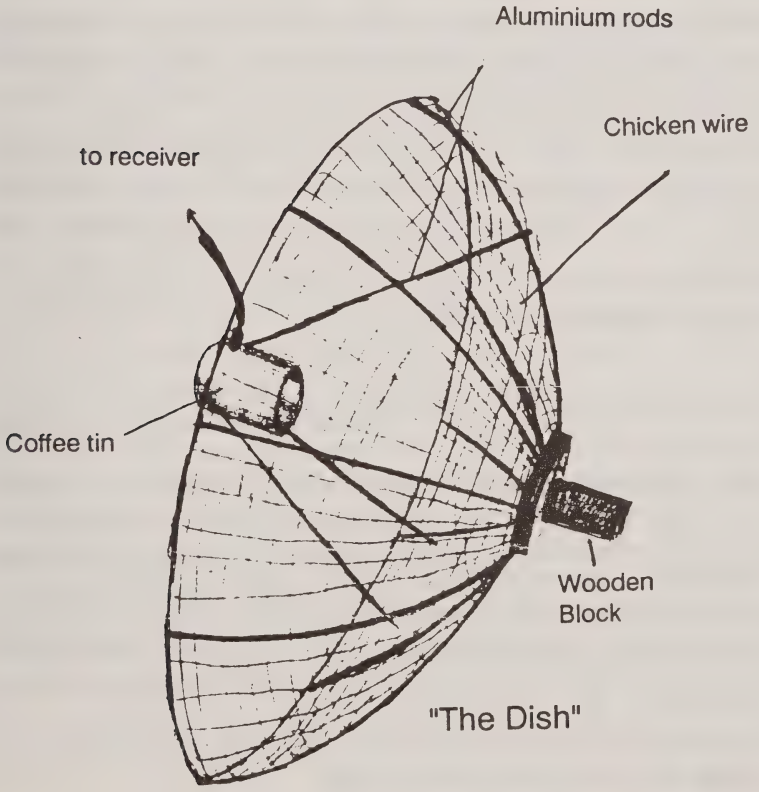
Graham Moss, ZL1TTX.



A HOME MADE DISH

David Shirley & Rob Carsley
Sixth Form
BRITISH SCHOOL IN THE NETHERLANDS

The idea of the satellite club began in October 1988. Our aim was to complete as many projects to do with satellites as we could. Obviously, one of these, if not the most important one, was the building of a satellite dish as cheaply as possible for use with our current METEOSAT reception equipment. After several weeks of deliberation, we decided on a plan. First, we would build the dish, from chicken wire aluminium poles and a few bits of wood, we would test this with the feed horn from the commercial dish that we have, and then if all the testing was successful, we would build a feed horn from more aluminium poles and a coffee tin and a permanent stand. We launched straight into making the dish with, what now seems, very poor planning:



"The Dish"

The Dish

One of the first things to be considered when making a dish is the way you plan to keep the dish in the perfect parabolic shape necessary. The obvious idea would be to bend the poles beforehand. We decided that this would be best done by placing the poles in a frame, hold them there and after about a week, they should be fixed in that position. Of course, when we took them out, they immediately returned to their original shape perfectly straight.
This of course, did not discourage us, we simply sat down and planned this time. The final decision was to keep the poles bent permanently on the dish. This, we decided, would be best done by having a wire which keep the poles bent by not allowing them to move outside of this circle. Since our dish was going to have a diameter of 1.50m, a focal length of 0.5m and therefore an f/d ratio of .33333, the wire had to be pi x D = 4.71m to keep the poles bent at the correct curve as given by the formula C=D / 16 (f/D).

This luckily, worked and we had a rather strong frame work for the chicken wire. We are planning to hold the chicken wire on to the frame with small ties. Of course, the chicken wire came in a flat sheet, so we had to think of some way of getting the mesh to follow the frame work. After discussing the ideas, we decided to put the chicken wire onto the frame, tie it on in certain positions on the aluminium tubing which would cause it to bulge in between the poles. We would then cut out the bulge and tie the two edges together. We found that this gave us an almost perfect shape. Now, all that had to be done on the dish itself was cosmetic work and testing with the commercial feed horn from our other dish which luckily had the same focal length.

Testing

Since our home made dish had nine poles and the feed horn from the commercial dish had three poles, it was quite simple to attach the feed horn to the dish with a few nuts and bolts on each of the dishes poles. We had no trouble with the focal length and after putting the dish in the right direction (a matter of trial, error and luck as well as a lot of frustration), we proceeded to receive signals from Meteosat.
To our surprise, the signal was by far stronger and better than the commercial dish. This was probably due to the great precision we made with it!!!! In fact, the dish was out of shape in many areas by as much as five or six centimetres, so it was a big surprise.
We continued to iron out the problems, especially the bumps at the joins where we had cut the chicken wire.

This was all we could do before continuing with the feed horn and stand, since it would have been then that we would have come up against the major problems...

Feed Horn
Constructing a feed horn for use with a parabolic dish with focal length to diameter ratio of 0.5 to 0.6 and frequency 1.69 GHz (METEOSAT)

The feed horn is the part of the satellite receiver which converts the transmitted waves, concentrated by the parabolic dish, into an high frequency electrical current which can then be "down converted" (reducing the frequency considerably) and used by a receiver and computer to produce a meaningful weather picture.

The feedhorn consists of a cylindrical horn mounted on three aluminium legs with a quarter wave monopole soldered to a coax connector placed near the closed end of the horn. (see figure 1)

Figure 2 shows the approximate dimensions for the cylindrical horn with use on a parabolic dish with focal length to diameter ratio of 0.5 to 0.6. The size of the horn and placement of the quarter wave monopole is crucial in determining the picture quality, but it has been found that the Maxwell house coffee tin (about 14 cm in diameter) is just about perfect for the 1.69 GHz signal transmitted by Meteosat, so long as the contents have been consumed first!

The feed horn should be placed at the focal point of the dish (in this case about 0.3m from the vertex) and aimed towards the vertex of the dish. The aluminium legs can be fed through the chicken wire reflector at the dish edges with a large washer either side and then tightened with a nut. See figure 3.

It is very important that the quarter wave monopole is horizontal when receiving so that the linear polarisation can occur otherwise picture quality will drastically deteriorate. To improve picture quality still further, ensure that the lead from the coax connector to the down convertor is as short as possible as this is where a lot of signal strength can be lost due to the very high frequency of the signal.

Constructing a mounting for the dish

Once the dish has been completed it must be pointed to the appropriate satellite. In the case of Meteosat the satellite is positioned where the equator and Greenwich Meridian intersect and about 36,000 Km up. So from London the dish needs to have elevation of about 30 degrees to the horizontal and to be pointed due south, remembering to keep the quarter wave monopole horizontal.

There is no easy way of securing the chicken wire dish permanently. When testing the dish, it was held by hand until the general direction and elevation were found and then the clamps and weights were used to "finely tune" the dish. However this was only a temporary arrangement and could not stand up to harsh weather conditions.

One way to permanently secure the dish could be to attach a pole who's length can be adjusted with an adjustable loop at the end and another adjustable at the top of the dish. When the dish is at the correct elevation, the bottom loop is adjusted until it is directly underneath the top loop and then a pole is placed vertically between the two loops and clamped.

This pole can be attached to a wall allowing permanent use of the dish.

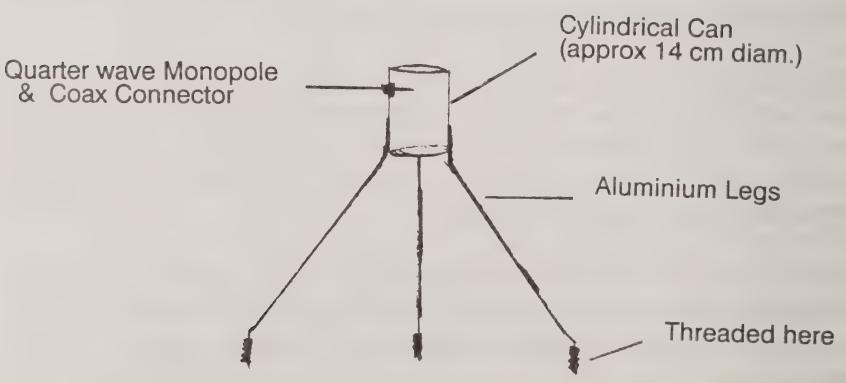


Figure 1: The Feedhorn

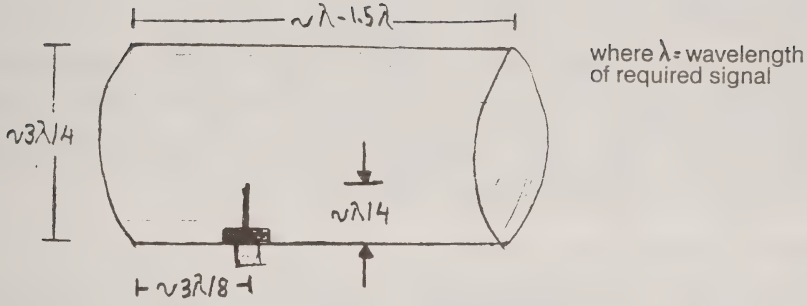


Figure 2: Feedhorn dimensions

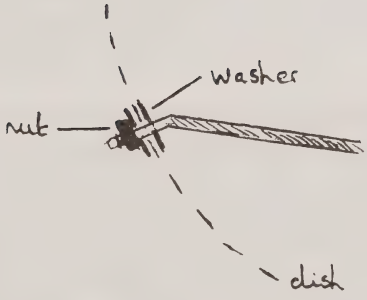


Figure 3: Attaching legs to dish

MODIFICATIONS TO THE MAPLIN WEATHER SATELLITE RECEIVER
by Peter Hayes, GM3RAO

I have used the Maplin weather satellite receiver for about a year with generally good results. However, as is inevitable with any "budget" design there are some short comings, and a little time and effort can improve some aspects of the receiver's performance considerably.

The receiver is a conventional 2 RF, Mixer and 10.7 MHz IF Design. The CA3189 FM demodulator works at 10.7 MHz, unlike most designs which have a second 455 KHz IF. The IF selectivity is determined by a 50 KHz and two 200 KHz ceramic filters and generally seems to be satisfactory. The free running local oscillator operates 10.7 MHz below signal frequency and is remarkably stable considering the high frequency it works at.

Later I added a Microwave Modules converter and preamp plus a home brew Loop Yagi antenna for Meteosat and GOES-E reception. Results, especially with the Despun antenna fault on Met 3 were marginal. Sometimes I got virtually noise free pictures and sometimes the screen was covered in lines where the signal fell below the FM threshold. GOES generally was noisy but watchable when at its best.

It was at this point that I began thinking about some way of improving results without investing lots of hard earned cash in a better preamp or antenna, (I'm not convinced the MM preamp combination is all that hot, especially for use with the marginal antenna systems).

While looking at the Maplin Rx circuit together with a study of the various satellite transmission specs, it occurred to me that the bandwidth of the Maplin Rx was far too wide for Meteosat. Polar orbiters like NOAA radiate a signal with around 30 KHz deviation, but Meteosat transmits around half this; 17 KHz. The approx 50 KHz receiver bandwidth is fine for NOAA allowing for Doppler drift as NOAA passes overhead (about 5 to 7 KHz depending on the precise orbit, greatest when on an overhead pass), and also allowing for the aforementioned 126 MHz VFO drifting a little. However, Meteosat does not exhibit any meaningful Doppler, being geostationary and VFO drift in a 4 minute transmission is very slight after warm up.

Since halving the bandwidth is the same as doubling the antenna size, any improvement that could be made would be very worth while.

After racking around in the spares box (my wife calls it something else also, Henry!) I came across a 10.7 MHz Xtal. Wired it in as per the circuit Fig 1, and bingo, - noise free Met 3 pictures ever since, and GOES-E was watchable most of the time as well. However, NOAA tuning was very touchy, the high level IR signal only just fits into the pass band, and Doppler plus VFO drift made tuning difficult. A little more thought produced the final circuit, Fig 2 The diode is normally open circuit, but closing the switch causes it to conduct, thus shorting out the Xtal and restoring the original passband. A small adjustment of the demodulator coil may be needed to line it up in the centre of the narrower passband. Fig 3 shows the layout used, this keeps the lead lengths to a minimum. NB, one track as to be cut as shown.

This mod is well worth doing at minimal expense and I've found it has extended to NOAA as well, since a weak distance signal will be just that little bit cleaner for just that little bit longer. It may be possible to do this mod to other receivers as well, eg. the Cirkit receiver, as most of them use 10.7 MHz as their first IF but I can't promise anything. The mod also helps keep out some of the weaker interference now so prevalent around 137 MHz although if it is caused by cross modulation then no amount of filtering will get rid of it.Tuning drift is more noticeable though and this led to the next logical modification- Automatic Frequency Control, AFC, ref Fig 4.

As I've said before, the LO is free running, at around 126.8.MHz for NOAA10, and is tuned by a varicap diode controlled by a potentiometer. I use a 10 K 10 turn Helipot and tuning is very easy (and no Xtals to buy, at one per satellite the cost adds up !). There is an output from the receiver for a tuning meter, and this voltage can be used to supplement the tuning voltage to give very effective AFC. The 741 op amp is used to amplify the small change in voltage as the received frequency changes and causes the LO to compensate. There are times when you may not want to use the AFC so provision is included to switch it out. The preset pot connected to the "out" side of the switch should be adjusted so the Rx doesn't change frequency to any extent when the AFC is switched out, so if you need to switch it out for any reason the satellite wont disappear.

A word of warning. If, like me, you suffer from pager interference, the AFC circuit can actually make it worse. The colossal Pager signal can pull the Rx completely off tune and when the pager goes away the satellite is not in the passband so you have to frantically tune around for it again. However, there are a number of causes and cures for the Pager phenomenon which I will talk about another time. Sufficient to say , I can leave the Rx tuned to Met 4 for hours at a time and there is no drift even in the narrow passband, just like Xtal control ! Also its fascinating to watch the LO frequency gradually fall as NOAA passes overhead.

Two simple mods then that can improve what is basically quite a reasonable receiver considering its price bracket.

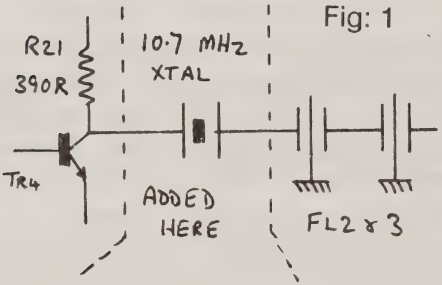


Fig: 1

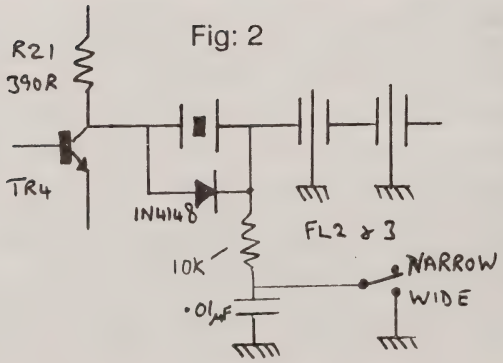
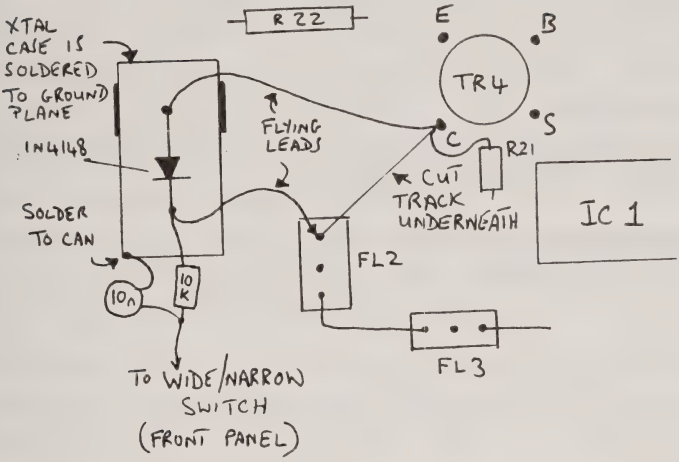


Fig: 2

Fig: 3 - Layout, Component View



MAPLIN RECEIVER MODS.
AGC Circuit

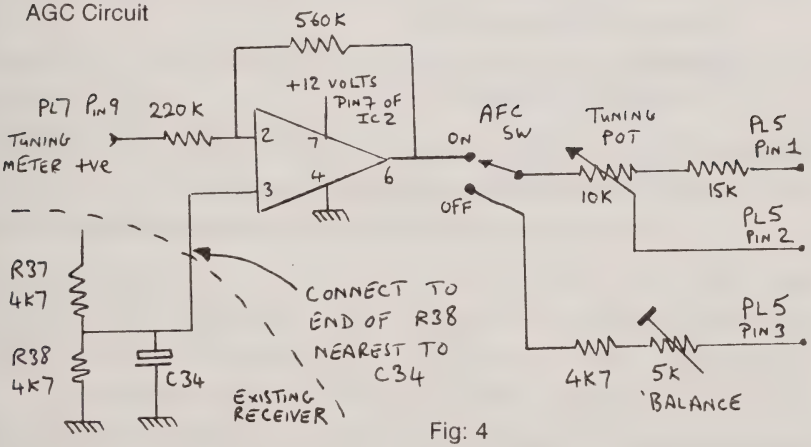


Fig: 4

MEMBERS ADS:

FOR SALE:
John Wedderburn,
Aldwickbury School, Harpenden, HERTS.
AL5 1AE

Framestore complete:
includes a professional standard case and on board mains power supply. Also includes the LOK board.

Fully tested and working: £275

FOR SALE

From the Secretary

IBM PC Clone comprising:

10 MHz Turbo System board (NEC V20)
640 K RAM
5 1/4" Floppy Disc drive
33 MByte Hard Disc Drive
Keyboard
Parallel and serial ports

The system can be supplied with
a) Monochrome Display 80 x 24 chars
b) CGA Display, Mitsubishi monitor, pixel size 0.40mm

This unit will be offered for sale in January 1990 following the successful acquisition of a bigger system. Members are invited to register their interest by sending me an sae (or just phoning) to check on the situation (see front cover for address/tel no.).
The system is currently in use producing the RIG newsletter and is in full working order. If the aquisition of the replacement does not happen then I will clearly withdraw the system from sale (for the March newsletter!!).

Asking price for the mono version £575
for the colour version £675

MEMBERS LETTERS:

Dear Phil,

First, may I say how much I have enjoyed reading the issues of RIG since I joined last summer. As a computing enthusiast, one of the first items that really took my attention was Ken Miller's Satellite Orbital Predication program in RIG 8. page 31. As a result, I have concocted a program for the BBC micro series which, from Kepler Elements stored in Data statements, produces a day by day list of passes within 35 degrees of longitude of Britain.
Passes the are particularly favourable (within +/- 15 degrees) are printed in bold type. In addition, times calculated for AOS in Britain, rather than the equatorial crossing.

In practice, I print out data for four months at a time (two months takes one sheet of listing paper), and store the information, back to back, in transparent inserts in a ring binder.

I enclose sheets for NOAA 11 for information.

I suspect that the program itself is too long to provide in RIG as a listing, but if it is a interest to you, please do not hesitate to contact me, and I can forward it to you on disc.

Personally I have found these lists of satellite passes far more convenient to use than "SATFOOT", although it takes an evening to reprogram the Kepler Elements into the listing as new ones become available, then print out sheets for all relevant satellites, it thereafter becomes the work of only a few seconds to identify all the pass times for any given date.

Les Hamilton.

PS
I must add, to give credit where it is due, that I have made use in the program of several of the calculations outlined by David Bailey in his article in RIG 15.

NOAA 11 (88-89A) - Overhead pass times

137.62 MHz

Kepler Data as at 10.43 GMT, Nov 16, 1988 | Inclination = 98.91440001 deg. | N/Period = 102.1348666 min. | SMA = 7235 km

Date	Deg W	A.O.S. (GMT)
01/01/88	199	03.25
	327	11.36
	352	13.18
	018	15.00
	145	23.51
02/01/88	171	01.33
	196	03.15
	324	11.26
	350	13.08
	015	14.50
	143	22.41
03/01/88	168	01.23
	194	03.05
	322	11.16
	347	12.58
	013	14.40
	140	23.31
04/01/88	166	01.13
	191	02.55
	319	11.06
	345	12.48
	010	14.30
05/01/88	163	01.03
	189	02.45
	316	10.56
	342	12.38
	007	14.20
06/01/88	161	00.53
	186	02.35
	314	10.45
	339	12.28
	005	14.10
07/01/88	158	00.43
	184	02.25
08/01/88	156	00.32
	181	02.15
	207	03.57
	334	12.07
	000	13.49
09/01/88	153	00.22
	179	02.04
	204	03.47
	332	11.57
	357	13.39
10/01/88	151	00.12
	176	01.54
	202	03.36
	329	11.47
	355	13.29
11/01/88	148	00.02
	174	01.44
	199	03.26
	327	11.37
	352	13.19
	018	15.01
	145	23.52
12/01/88	171	01.34
	197	03.16
	324	11.27
	350	13.09
	015	14.51
	140	23.42
13/01/88	168	01.24
	194	03.06
14/01/88	166	01.14
	191	02.56
	319	11.07
	345	12.49
	010	14.31
15/01/88	163	01.04
	189	02.46
	317	10.57
	342	12.39
	008	14.21
16/01/88	161	00.54
	186	02.36
	314	10.46
	340	12.29
	005	14.11
17/01/88	158	00.44
	184	02.26
	209	04.08
	312	10.36
	337	12.18
	003	14.01
18/01/88	156	00.33
	181	02.16
	207	03.58
	335	12.08
	000	13.51
19/01/88	153	00.23
	179	02.05
	204	03.48
	332	11.58
	358	13.40
20/01/88	151	00.13
	176	01.55
	202	03.37
	329	11.48
	355	13.30
21/01/88	148	00.03
	174	01.45
	199	03.27
	327	11.38
	352	13.20
	018	15.02
	146	23.53
22/01/88	171	01.35
	197	03.17
	324	11.28
	350	13.10
	015	14.52
	143	23.43
23/01/88	169	01.25
	194	03.07
	322	11.18
	347	13.00
	013	14.42
	141	23.33
24/01/88	166	01.15
	192	02.57
	319	11.08
	345	12.50
	010	14.32
25/01/88	164	01.05
	189	02.47
	317	10.58
	342	12.40
	008	14.22
26/01/88	161	00.55
	187	02.37
	314	10.47
	340	12.30
	005	14.12
27/01/88	159	00.45
	184	02.27
	312	10.37
	337	12.19
	003	14.02
28/01/88	156	00.34
	182	02.17
	207	03.59
	335	12.09
	000	13.52
29/01/88	153	00.24
	179	02.06
	205	03.49
	332	11.59
	358	13.41
30/01/88	151	00.14
	176	01.56
	202	03.38
	330	11.49
	355	13.31
31/01/88	148	00.04
	174	01.46
	199	03.28
	327	11.39
	353	13.21
	018	15.03
	146	23.54

Dear Phil,

KEPLERS FROM YOUR OWN OBSERVATIONS

During the course of some 3 years and more active satellite monitoring I have seen a number of new weather satellites launched and I have carefully logged the times of aos (acquisition of signal) and los (loss of signal). These simple measurements can be used, together with an estimate of the maximum elevation of the satellite as seen from the transmitted picture, to produce quite reasonable "dummy" Kepler elements.

With experience I think that one can judge elevation to within perhaps 10 degrees. Also, the direction of travel can be identified i.e. whether the craft is northbound or southbound. So it is then a fairly straightforward matter to add about 100 minutes to the pass time and so get a fair idea of when to expect the next pass. Obviously this assumes that the pass was not identified as being a far westerly pass which would mean that the craft would be out of range for several hours.

If we had NORAD on our doorstep we could probably ring them up and ask for Kepler elements, and, assuming that they were monitoring Russian satellites as well as we RIG members are (!) they would probably provide us with a set of fresh ones.

Of course life isn't like that. When we hear the first signals from a new Meteor or Cosmos transmitting APT we are on our own. However, help is at hand in the form of the domestic computer and a set of old Kepler elements.

I was faced with this challenge when I heard my first "new" launch, Met 2/16, then Met 2/17, 2/18 and Met 3/2. Last week (at the time of writing) the strains of Met 3/3 were detected at this station and so more practice at the noble art was required.

I found it surprisingly difficult to get advice on this problem and yet I knew that it must be done regularly elsewhere!

On this occasion I carefully noted down the sequence of events to obtain "dummy" Keplers and so here, for those new operators who want to generate their own element sets while waiting for the official ones to materialise, is a summary of one method that can be used.

The first notes to log, as mentioned above, are aos, los, estimated elevation and direction - north or southbound. Times to about a minute are OK. The next step is important: you must identify the series to which the new satellite is most likely to belong. This is not too difficult.

The latest craft revealed its type to me by transmitting very good quality infra-red at 2114 UT on 25th October late at night and by showing more planet width per pass - implying a higher orbit. This all indicated a Met 3/ series, and knowing that Met 3/2 was currently off and had already passed by it seemed reasonable to assume that the new object was Met 3/3.

The previous Meteor launch that I had heard was 2/18 and it had been identifiable as being a series 2 satellite from its visible picture.

So the next task was to manipulate the Kepler elements for Met 3/2 to produce pass times that would coincide with the new satellite. With the previous launch, Met 2/18, I had adjusted the elements for 2/17 to produce working elements.

I started off with the latest set of Met 3/2 elements kindly sent to me by Des Watson. These were for epoch 1989 day 284 for which the associated RAAN was about 93 degrees. Although I recorded several passes during the following hours my accurate measurements were made on 28th October for each pass of the day.

From the Met 3/2 predictions for that day it was passing over the UK some hours later travelling southbound. I therefore reasoned that the RAAN figure should be reduced to bring forward the pass times.

I reduced the RAAN in stages, and each time ran a set of predictions to list the pass times and check things were OK. The figure of 30 was achieved which gave amazingly accurate predictions!

If you substitute RAAN 30 and rerun your predictions for that day the following emerges:

Test Sat: AOS 0751UT LOS 0806UT max el 14 deg East SB
AOS 0942UT LOS 1001UT max el 57 deg East SB
AOS 1132UT LOS 1150UT max el 34 deg West SB

The above is the format that my home-brew software produces as run on my CPC612B computer.

Observations logged:

AOS 0754UT LOS 0804UT
AOS 0942UT LOS 1000UT
AOS 1131UT LOS 1150UT

You will realise my feeling of pleasure at cracking the problem of future predictions while waiting for official elements to appear. These elements held true for several days enabling me to record passes in my absence for later examination. I made minor adjustments to MA which had the effect of changing the pass elevations slightly.

This method of progressive RAAN adjustment depends on the availability of good AOS/LOS times and therefore cannot work easily for any Cosmos satellites which are only on for short periods. I hope that perhaps newer members might find the above useful on occasions.
Yours sincerely,
Lawrence Harris.

Dear Phil,
Just a short note to thank those several RIG members who responded most helpfully to my request for help on RTTY and other sources of information in the last RIG magazine. I have had a number of large packages from members including D. Hardman of Littleborough and Brian Coupe of Doncaster.

It will take some time to digest everything.

I also had phone calls from RIG members including Graham Smith whose advice I took and bought the book 'Communications Satellites'. This book lists RTTY frequencies for this type of information but may be out-of-date on the one given for the Cuban Prensa Latina Station on 14.901 MHz. This station apparently broadcasts Soviet satellite launch information between 1200 and 1700UT. I have not managed to receive these broadcasts. There is a station near that frequency but I cannot decode its RTTY. When I've cracked it all I'll send a summary to RIG.

Sincerely,
Lawrence Harris.

Dear Phil,

NEW METEOR SATELLITE 3-03

During the evening of October 25th I was constructing an antenna for a radio astronomy project when I heard the unmistakable sound of infra-red transmissions from a series 3 Meteor satellite. I carefully logged the time at 2114UT and switched on the framestore. The picture was of good quality and identical to the format used by Met 3/2. The latter satellite had passed by some hours previously without any transmissions and so I assumed that this was 3/3.

I logged the LOS time as 2114UT and set up my equipment for overnight recording after estimating the likely times for future passes. The following day I had a tape full of data.

On the first pass (2114UT) I had difficulty in identifying the direction of travel but the second higher elevation one displayed a super image of Italy while moving northbound.

As the time was late I was reluctant to ring up RIG members but finally decided to ring Reverend James Brown, with whom I spoke for a few minutes. He pointed out the possibility of a series 2 satellite being fitted with the updated infra-red scanner, though in the event this doesn't seem to have been the case. I wasn't able to contact other RIG members the next day because many had gone to a meeting. We west-country folk miss the opportunity to attend these meetings.

Finally, I was puzzled over an item on the launch in the wefax bulletin sent to me by Des Watson which stated that 3/3 had been launched on the 26th! As mentioned above, I saw 2 pictures from it on the 25th.

Sincerely,
Lawrence Harris.

Dear Phil,
I write these few notes to see if I can elicit some help.

Since joining RIG, my son and myself purchased a Maplin RX and Decoder with the BBC program separate, in other words you have to type it in, this I think is where our problems began.

Typing in the program was no trouble and when run we got out of all the bugs, like brackets, missing, colons and comas etc., you know the usual quick typing - but one bug we cannot get rid of and its at line 820, which in M/C is "BBC TEST" it keeps separating "NO SUCH VARIABLE AT LINE 820" the program stops but erase line 820 and the program loads and runs leaving you a white square on the screen, put there very slowly a line at a time and the controls have no effect. I now have a chicken and egg situation, and cannot check the decoder till I have a program. The construction of the decoder and testing so far confirms with Maplin's instructions, so if a RIG member has the program that works I would like to obtain it from him, I can send a disc plus postage both ways and any expense incurred on a BBC.B.

Many thanks.

Ron Ratcliffe. G4LRY

P.S. Reading newsletter about being expensive to make back issues why not photocopy the relevant and charge accordingly.

Dear Mr Seaford,

I write in order to express, through your columns, my appreciation for the quite extraordinary goodwill and help received from both RIG members and the Amateur Radio fraternity.

My initial foray into the world of satellite reception began only 18 months ago, mainly as a means of enhancing my life long work in Climatology. Since then it has blossomed into what is almost an obsession. However, my initial steps were both faltering and faulted, and I had to turn to others for guidance and help.

It was a pleasure to find a whole wealth of goodwill amongst both Amateur radio fans and RIG members, who, despite my apparent total lack of knowledge in their subject, threw themselves whole heartedly into the task of solving many of my problems.

In particular I would mention Dave Wright of Dartcom, a fellow 'Midlander' by birth, who not only gave expert advice verbally and in writing, but called here on several occasions to do "mods" to their synthesised receiver and offer guidance and help.

Since all of my climate data is computer processed, and since I was upgrading to an Archimedes, I opted for the Spacetech podule and software for satellite acquisition and processing. In this respect also I have received unstinting advice and help from Chris Hornby and his wife, both of whom have also called in when passing to offer 'on-site' assistance.

I have now reached the stage where I can receive and process quite excellent images from both Meteosat and the orbiters. Though I do realise from reading the RIG magazine that most members do not take kindly to computer based systems. I have found the Spacetech system quite superb in its operation, with images of excellent quality and resolution. This makes it an ideal "tool" for a person in my position who has to make daily use of a computer in any case.

Though much of the magazine is technically far above my head, I do find it of great value in determining orbits from computer based programs, as well as offering advice on the subject in general.

May I wish you every success in your ventures, and thank all of your members who have rallied to my help over the past 18 months. This has been much appreciated.

Sincerely C.G. Roberts
HALESOWEN CLIMATOLOGICAL STATION

RIG HELPLINES:

General Enquiries & PCB Supplies
Phil Seaford 0525 384419

NOAA info. Henry Neale 094 585 353

Russian, Chinese satellite info/status
Les Currington 0707 326058

Schools/ Educational enquiries,
Meteosat status and European Space Agency Colin Hall School 021 778 1311
Home 021 449 0006

Framestore technical support:
Mike Coombs 0530 243494
7.30pm - 9.30pm

Ian Gurton 05827 377
7.30pm - 9.30pm

Dermot Dobson 22 Ramsey Road,
Headington, Oxford.

RIG Dish & Feed Horn Stockists:
see back of previous newsletters

Supplier problems co-ordinator
Stan Ames 05827 60538

RIG at Rallies 1990
Mike Coombs see above for No.

RIG MICRO SPECIALISTS:

BBC Micro	Stan Ames	see above
Commodore Amiga	James Brown	0656 712632
Atari ST, Archimedes	Peter Newman	0487 812121
IBM PC	Dermot Dobson	see above

Please call at sensible hours ie 7.30pm - 9.30pm

martelec

SYSTEMS & MODULES FOR BBC, ARCHIMEDE

ARCHIMEDES SYSTEM

Easily the best system currently available for the Arch. We offer the superb Spacetech Podule and software with the Martelec MSR30 receiver, MSC20 low-noise downconverter, and MSD20 95cm dish aerial. We believe this is an unbeatable package, combining the best of software and hardware.

The latest software release can be fully exploited with the MSR30 receiver, enabling full NOAA passes to be stored in high resolution.

This highly acclaimed system has many, many useful and clever features - too many to list here. To find out more, ask for our info. pack.

Spacetech Podule & Software	£299.00
MSR30 Receiver	£328.00
MSC20 Downconverter	£172.50
MSD20 95cm Dish Aerial & Feed	£156.00
MSA20 Cross-dipole Aerial	£39.95
Normal price	~~£995.45~~
Special offer price	**£895.00**
Carriage & insurance	£18.00

WXSAT BBC SYSTEM

The popular WXSAT System has now been upgraded with the new MSR30 Receiver. Although being the 'entry level' system, WXSAT software package has a surprising number of unique features, and produces a respectable 160 x 250 pixel resolution, with 8 greyscales. This remarkable system features zoom (up to x8) without loss of screen resolution, disc read/write printer dump routine, user defineable colour pallete, text overwriting, and a host of set-up and graphic features.

The system may be economically upgraded to a high-resolution system by substituting the MSG20 Graphstore for the MSS20 Interface.

MSS20 BBC Interface and software	£86.19
MSR30 Synthesised VHF Sat. Rec,	£328.00
MSA20 Crossed-dipole VHF Aerial	£39.95
Normal price	~~£454.14~~
Special offer price	**£399.00**
Carriage & insurance	£6.00

GRAPHSTORE BBC SYSTEM

The MSG20 Graphstore System combines a page, high-resolution framestore and graphics processor with the powerful GRACE software package to deliver the best images you've ev seen using a BBC micro - 512 x 512 x 128 gr cales, or 256 x 256 x 128 greyscales in 8-fram animation mode.

Zoom ratios are selectable from 1-16 with smooth X-Y scrolling over the whole image. A included are four powerful contrast enhancem algorithms, complete with spectral hystograms Text overlaying is provided in a choice of sizes printer dump routine is available.

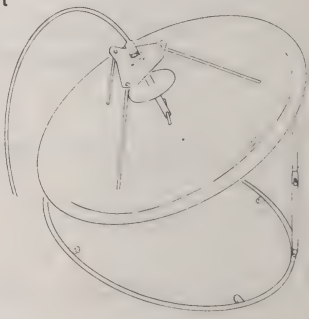
MSG20 Graphstore & software	£399.
MSR30 Receiver	£328.
MSC20 Downconverter	£172.
MSD20 95cm Dish Aerial & Feed	£156.
MSA20 Crossed-dipole Aerial	£39.
Normal price	~~£1096.~~
Special offer price	**£986.**
Carriage & insurance	£18.

MSD20 Dish Aerial

95cm Dish, mount, and feed assembly. A high-quality product using our latest silver-plated dipole feed. N-type connector output

£156.00

Carriage£18.00



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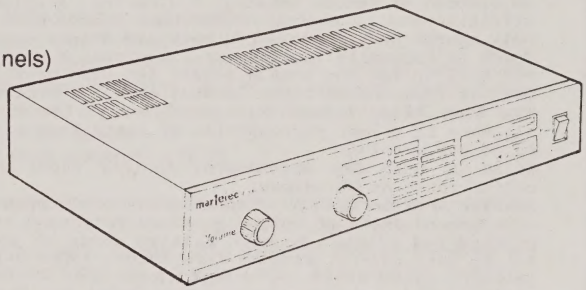
ntroducing the new MSR30 SATELLITE RECEIVER.....

meticulously designed and engineered
cond-generation satellite receiver for NOAA
d Meteosat reception, setting new standards
performance – particularly interference
jection.

eatures include:

- Fully synthesized (6 preselected channels)
- Built-in scanner with intelligent halt
- High rejection of interference
- Auto tape record switch facility, with adjustable drop-out delay
- Separate built-in power supplies for receiver and downconverter
- Automatic Frequency Control
- Adjustable APT output level
- Tailored APT Passband filter

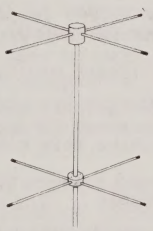


mplete cased receiver with all connectors and
bles (except aerial) £328.00 incl.
Special offer price **£295.00 incl.**
Carriage and insurance £6.00

[Aerial cables factory-made to length: £8.50 plus 50p/metre]

SA20 Crossed-dipole 37MHz Omni-directional erial.

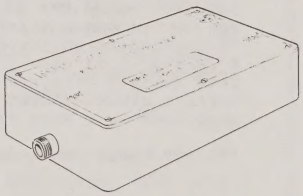
pplied complete with
asing harness



9.95
arriage and
surance £6.00

MSC20 Low Noise Downconverter

With built-in GaAsFET preamplifier, this is the lowest noise downconverter in its class (typ. 1.0dB). Has temperature controlled crystals for Meteosat channels A1, A2 (1691MHz & 1694.5MHz). Output is 137.5MHz. Comes complete in weatherproof ABS enclosure, and with N-type to N-type cable and connectors. **£172.50**
Carriage and insurance £3.75



ook List

eather Satellite Reception Chris Hornby	£9.75+£0.60
roduction to Satellite Television F A Wilson	£5.95+£0.60
F-UHF Manual RSGB	£8.94+£1.60
tellite Experimenter's Handbook ARRL	£6.47+£1.00

nd a SAE for full list of publications

pecial Christmas offer prices apply to all orders before January 31st

RDERING INFORMATION All prices include VAT. Payment by cheque or postal order made yable to 'Martelec Ltd'. Visa & Access cards accepted.

8 Queens Road, Farnborough, Hants, GU14 6JR. Tel. (44) 0252 376068 Fax. (44) 0252 737620

spacetech

Here are a few ideas for your Christmas Stocking! It is only a representative sample of our range of Space Science and Remote Sensing resources. Please write or phone for a complete list and we will be happy to discuss in more detail your specific requirements. In the meantime, it might be a good time to get your highlighting pen out and leave this advert where it might be seen by XYLs etc.

BOOKS: Price

Spaceview UK: A guide to Landsat TM images, includes 9 large loose colour satellite prints. Excellent value. 5.50

Weather Satellite Reception: Chris Hornby. A guide to get you started, Aimed at the beginner,but useful reference. 4.95

Sourcebook of Remote Sensing: D.J.Carter. A guide to products, utilities etc. V.useful information source for enthusiast.We are now the only source of this valuable book and stocks are limited 15.00

Guide to Facsimile Stations: Klingenfuss. A wealth of information not only on FAX but NOAA,Meteosat etc.News agencies, Meteorology. 12.00

Britain from Space: Colour Landsat Atlas of British Isles. 12.50

The Home Planet: Superb large "glossy".(needs a big coffee table) The ultimate in colour reproduction of earth images from space. Price includes £2.00 P&P premium: 24.50

Atlas of Deep Sky Splendours: Another super glossy to weigh down your coffee table at Christmas! 29.50

Amateur Astronomy: A comprehensive and practical survey. Large and contains hundreds of colour pictures.Very good value. 7.95

Posters and prints: We have a large range of posters, far to numerous to fit in this advert, ranging from Europe (NOAA HRPT colour) at £1.50 to the Earth by Night at £4.95. Prints range from 0.95 (5"x7" Earth from Apollo) to 19.50 (Large glossy prints from NRSC) The Earth from Apollo laser scan print (16" x 20") at 6.50 is worth seeing.

The Earth by night poster merits a special mention, it is a Mosaic of night time satellite images in visible light: Shows energy use and artificial light distribution: Comprehensive key and text leaflet. Superb conversation piece!As reviewed in the Guardian) Luminous! 4.95

Videos: All NRSC videos 51.75 or 10.00 hire (+10.00 dep.+1.00 P&P)

Introduction to Satellite Remote sensing.Towards a greener Planet. Coastal and Marine applications.

Conquest: A History of Space achievement from v1 to Skylab & Soyuz in 3 1hr videos with comprehensive NASA and Soviet footage.13.75ea (to buy)

Slides: (We have a large stock and can search for special requests)

Miscellaneous:

*NASA space pens, may be used anywhere, from 20,000 leagues under the sea to outer space.The ultimate in communications technology:used on all U.S. and Soviet space missions 2.99

*1990 Wonders of the Universe Calendar: Colour/each pic frameable: 4.95

T-Shirts: 4.95 each

Good quality t-shirts from the Met Office in 4 colours and sizes, ring for current stock availability: Logos with pictures and/or appliques include: Happiness is a Warm Front,I'm wrapped in Sunshine,Here comes the Sun!

******* Single book orders 1.00 P&P. All other orders 2.00 P&P.**********
VAT inc. where applicable

Don't forget our range of equipment: The Weather Satellite Podule: (256 colours or 84 grey levels on screen,640x512 resolution, 200 frame animation..for Archimedes) NEW: RGB/Greyscale card. Demo discs £5.00 each, animation &/or interactive. Atari demos also available.

ALSO:SHF receiver with computer interface. VHF receiver with computer interface. The original SHF-Design 67 ele Yagi from Germany available ex-stock, NOT a Chinese copy..superbly engineered and gives excellent results with Meteosat 4.

ALSO: ICS FAX1, Digitar weather equipment, HF225 etc etc phone for quote.

LUCY HORNBY
SPACETECH
21 West Wools
Portland
Dorset DT5 2EA
United Kingdom
Tel: 0305 822753

Access

FENWAY WEATHER SYSTEMS PRICES

Fenway Weather Systems are proud to be the distributor of the TIMESTEP-DIGITAR range of weather stations. Now for the first time, these beautifully made American instruments are available at sensible low cost prices.

TWR-3 A tiny, completely stand alone unit featuring :-
Wind speed. Wind direction. Wind chill factor. Wind gust record. Outside or inside temperature. High/low temperature record. Metric or imperial. 12/24 hour clock. Scan feature. Daily and yearly rainfall optional.
TWR-3 £99.50 RG-3 Rain collector £36.95

WD-2 A small completely stand alone unit featuring :-
Wind speed and alarm. Wind direction. Wind chill factor. Wind gust record. Outside temperature and alarm. Inside temperature and alarm. High/low temperature alarm. Metric or imperial. 12/24 hour clock. Programable scan feature. Daily and accumulated rain fall optional. Calendar. Illumination.
WD-2 £149.95 RG-2 Rain collector £36.95

PCW A unique, totally computer controlled weather station. Any standard PC type computer with XT or AT expansion slots can be used. Operating in a "background mode", this weather station will enable your PC to carry on working on your business software as normal. Data will be stored for recall later. Featuring :- Sea level barometric pressure. Wind speed and alarm. Wind direction. Wind chill factor. Wind gust record. Outside temperature and alarm. Inside temperature and alarm. High/low temperature store. All metric and imperial units. 12/24 hour on board clock. Daily and accumulated rainfall optional. PCW-PRO software optional.
PCW £199.95 RG-2 Rain collector £36.95

PCW-PRO Incredibly sophisticated automatic data logging software for the PCW. This software automatically plots each parameter in easy to understand 24 hour graphs. Identifying trends has never been easier !. Days, months and even years, may be automatically stored on disc for analysis in the future. For the advanced user a conversion program is included to produce ASCII files for database and spreadsheet applications. ASCII file dumps for other program use such as databases and spreadsheets. **PCW-PRO £59.95**

PCSAT+ Come and see this incredible weather satellite system running live. With the optional VGA600 card it will display 800 pixels, 600 lines and 256 colours simultaneously on the screen. Compare it side by side with the framestore and see the amazing 7 times better resolution in monochrome and 27 times improvement in colour. If you already have a Meteosat receiver the cost is just £299.00 for the Interface, Interface Card and software. The VGA600 card is available at £299.00.

VAT at 15%. Carriage extra. ACCESS, MASTERCARD and VISA welcome.

Fenway Weather Systems
Victoria Way Industria Estate Newmarket CB8 7SH England
Tel. 0638 665300 FAX. 0638 666555

TIMESTEP PCSAT+

The PCSAT+ is a new addition to the low cost Timestep *MULTISAT* range of weather satellite equipment. It will run on every 640K computer from an XT or clone with CGA, right up to a 386 with 800x600 pixels. The system is configured to allow easy upgrades, for example if screen resolution is important, then the Timestep VGA600 card can be fitted to an ordinary XT to give 800 pixels, 600 lines and 64 grey levels. For very low cost use a special mode is provided for the Amstrad 1512 which fully exploits it's almost unused grey scale mode. All actual IBM computers are catered for such as the PC, XT, AT, and Models 25, 30, 50, 55, 60, 70 and 80. All other IBM clones are fully catered for.

The YU3 framestore used to compare computer systems is now finally put to bed. The Timestep *MULTISAT* with VGA600 gives 800x600x64, a staggering 7 times better than the framestore's 256x256x64. The VGA600 gives a completely flicker free display unlike the Amiga and some other systems. The VGA600 can also use colour and display 800x600 in 256 colours at the same time on the screen, an incredible 26 times more resolution !

The image is stored on disc in *full satellite resolution.* This may be displayed in ZOOM format so that every pixel is shown, even in CGA. Later when you expand your system with a better graphics card, you will find that all the information stored on your old equipment can be viewed in the highest quality the satellite allows.

High speed flicker free animation of 8 images in 300x400 in 16 greys is available on EGA and VGA systems. If you have 4Mb of EMS then 64 high resolution frames can be animated.

Every Timestep *MULTISAT* comes complete and ready to run from Meteosat or GOES, just add a suitable computer and monitor to receive live pictures as often as every 4 minutes. The optional software supports most VGA modes if you already have a VGA card fitted.

Features

Display up to 600x800 in 256 colours (option)

ZOOM into *full satellite resolution*

Animation of 16 to 64 300x400x16 images (option)

Works with standard XT clone computers

Easy and cheap upgrade path

Store *full satellite resolution* data

Greys shown on a standard VGA monitor, EGA and CGA need a grey scale monitor.

Standard hardware provided

3m 55 element Yagi antenna
GaAs FET Antenna pre-amp
20M Yagi cable
Software discs
MULTISAT interface
MULTISAT Meteosat/GOES receiver
PC 1/2 size interface card
Comprehensive manual

Price for all above £649.00

Options As above but less all receiving equipment to alow existing users of Meteosat/GOES to upgrade **£399.00**

Animation software for EGA or any VGA (not IBM model 25 or 30) **£79.95**

VGASAT software for all VGA systems (any PC with any VGA card or IBM model 25, 30, 50, 55, 60, 70 and 80) **£79.95**

NOAA software with automatic picture capture ! AT's and 286 computers only. **£79.95**

VGA600 video card giving 800 pixels, 600 lines and 256 colours or 64 greys. **£399.00**

VGA480 video card giving 640 pixels, 480 lines and 256 colours or 64 greys. **£299.00**

Vat at 15% Carriage above **£300.00 £15.00** below **£300.00 £5.00**

Timestep Weather Systems
Wickhambrook Newmarket CB8 8QA England
Tel.0440 820040 Fax.0440 820281